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WITH 61 PLATES AND 13 TEXT FIGURES



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# THE PHILIPPINE JOURNAL OF SCIENCE

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No. 1

## GENERA HYMENOPHYLLACEARUM<sup>1</sup>

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ELEVEN PLATES AND ONE TEXT FIGURE

Whoever devotes long and careful study to a group of plants becomes acquainted with their several significant characteristics and recognizes minor groups. He recognizes the groups of individuals as species, and is usually disposed to regard the definable groups of species as genera. Thus the men who have studied the Hymenophyllaceae most comprehensively, Presl and van den Bosch, have felt constrained to recognize many genera. Prantl recognized a smaller number of genera, chiefly because he knew a smaller range of species. Hooker and Sadebeck, who cataloged very many species, the former in *Species Filicum* and *Synopsis Filicum*, the latter in the *Pflanzenfamilien*, and who went back to the genus concepts of Swartz, are not exceptions to this rule, because, however many species they may have seen, they did not devote to them the careful and detailed attention necessary to an understanding of significant characteristics and of the affinities which these peculiarities make plain.

I began the detailed study of these ferns without suspecting that it would result in dissatisfaction with the general view that

<sup>1</sup> This paper expresses the general results of intermittent studies carried on since 1908, and for a considerable part of my time since 1928. It has been composed in the Herbarium of the University of California, for the use of the facilities of which I gladly express my sense of obligation. I am indebted to Doctor Maxon for many items of counsel and material assistance, and to Mr. C. V. Morton for a very careful criticism of my manuscript; without committing these gentlemen to my conclusions, I thank them for their help.

two genera compose the family.<sup>2</sup> I knew already that some of Presl's genera, as *Cephalomanes* and *Pleuromanes*, were based on imaginary characteristics, and did not suspect that they nevertheless represented natural groups of species worthy of generic status. With time, my experience was exactly that of van den Bosch: "Species Hymenophyllacearum diligenter et accurate investigatis, genorum statuendorum necessitas in dies magis me urget horumque notas et limites sensim melius perspicio." Because this improvement of understanding has been gradual, and

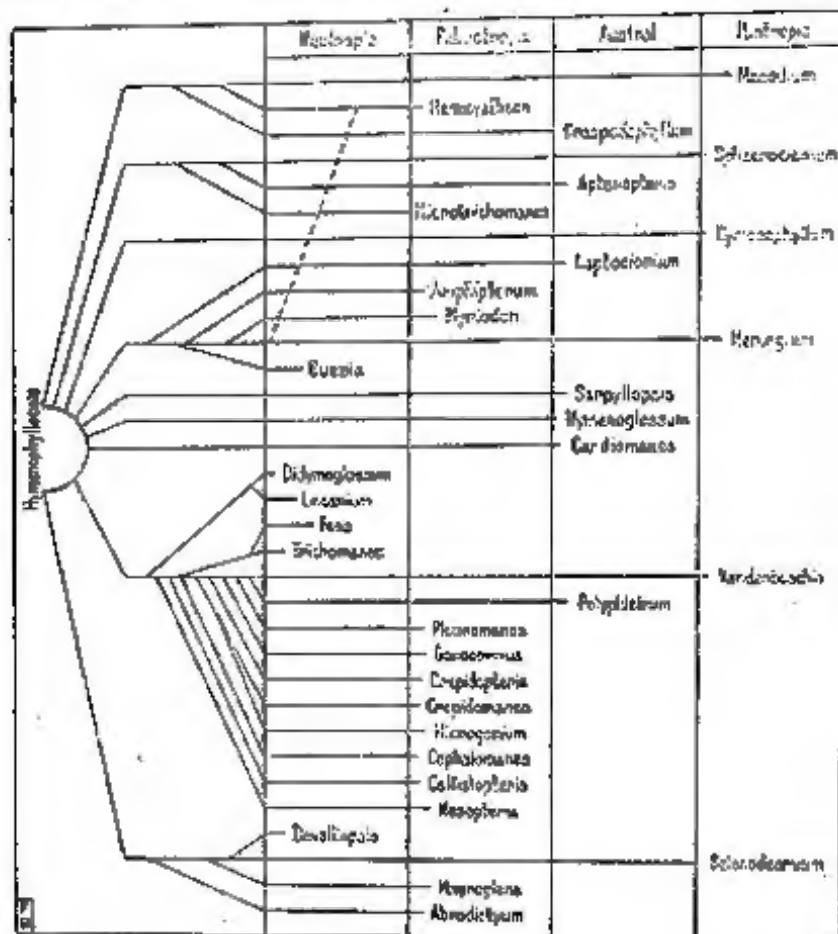


Diagram of affinities of genera.

<sup>1</sup> *Loxsonia* and *Loxsonopsis* are not included in this study.

<sup>2</sup> *Hymenophyllaceae Javanica* (1861) 6, footnote.

without end, I have abstained from the publication of ideas on genera, until my familiarity with the species is as complete as it seems likely to become. Here, I would again follow van den Bosch,<sup>4</sup> quoting Fries: "Vana sunt nova genera, sine universali specierum cognitione et praecipue morphoscos historia."

Because I have discussed elsewhere<sup>5</sup> in some detail the two principles which must determine the recognition of genera, this phase of an introductory discourse may be treated briefly here. These are:

**Naturalness.**—A genus must be a natural group. Like a family of men, it must consist of "blood relatives", including all within some accepted measure of affinity, and only these. Such a genus is literally, not figuratively, natural; it exists in nature. Two species of diverse descent (beyond the accepted measure of affinity) do not belong in one genus, though their resemblance may reach apparent identity. In our verbal definitions of genera we use words describing their (usually visible) characteristics; but no such characteristic is fit to serve always as a generic criterion. Phyletic unity, so far as all our evidence lets us recognize it, is the sole categorical test of a genus. Literally speaking, the descendants of a given plant of a century ago are a natural group. The descendants of a plant of a million years ago are a natural group, perhaps, however, represented by several of our species. So also are the descendants of a plant of fifty million or more years ago.

If we knew the genealogies of our plants for these periods, the sole criterion in determining how far back we should go for the common ancestor of a genus would be the other principle:

**Convenience.**—Subject always to the preceding principle (naturalness), a genus should be delimited with all possible regard to our convenience. In its application, this principle develops several aspects. In the first place, it serves our convenience to establish genera which we can recognize easily by their verbal definitions. Again, it may be convenient to have our genera recognizable by a group of common characters, rather than by some one arbitrary criterion;<sup>6</sup> that is, the natural-

<sup>4</sup>Synopsis (1839) 5.

<sup>5</sup>The Oriental Genera of Polypodiaceae. Univ. Calif. Publ. Bot. 16 (1923) 45-124.

<sup>6</sup>This may be disputed; but I believe that our comfortable acceptance of genera recognized by arbitrarily chosen criteria is the result of adjustment, by usage, to a procedure which would be uncomfortable without the adjustment.

ness of a genus should be reasonably recognizable. In other cases, it surely serves our convenience to distinguish as genera groups with few or single conspicuous characteristics. Again, very large genera are inconvenient. *Trichomanes* and *Hymenophyllum* have become inconveniently large genera. "But convenience will not justify us in dividing a genus of a thousand species along any except natural lines; nor let us maintain a genus of two species, unless they are nearly related."<sup>1</sup>

After the removal of several foreign elements *Trichomanes* of Linnaeus remained a natural genus. It would be equally natural still, but would be very inconvenient, comprising the whole family. When Sir James Smith removed one species and set up *Hymenophyllum*, the result was two natural genera. However, with time, the two have not merely outgrown convenience, but they also have not remained convenient in other respects, nor even natural. That they have not remained convenient is attested by the number of species that have been referred to both *Trichomanes* and *Hymenophyllum*, because they share their formal articles of definition—consider *Didymoglossum*, *Moringium*, *Serpyllopsis*. That in recent time they are not natural, is illustrated best by *Sphaerocaulium* and *Microtrichomanes*, together forming a natural group and reasonably forming a genus, but with the former treated as *Hymenophyllum*, the latter as *Trichomanes*.

As to the extent to which convenience is served by the recognition of more and more genera, workers cannot be expected to agree. The convenience of the man who wants merely to find names for his specimens, by the most superficial examination which will satisfy this purpose, is not that of the man who seeks to understand the phylogeny of the groups, by the most careful study of each species. The treatment which serves my convenience has changed essentially with the years of study. I find satisfaction in the fact that most of the genera I recognize are those long since set up or maintained by Presl and van den Bosch. Presl must have had a rather remarkable eye for genera. His diagnostic characters might range from imaginary to fantastic—consider *Cephalomanes*, *Pleuromanens*, and *Abrodictyum*; but each of these represents a natural genus. As to the number of genera, Presl and I are not far apart. Presl named twenty-nine genera, some of them almost undefined. Van den Bosch described twenty-four. Including two monotypic ge-

<sup>1</sup> Copeland, op. cit., p. 18.



nera and one of two species which they never saw, I recognize thirty-three.

The genera herein maintained or established are those which seem to me to merit recognition, after test by the two principles already presented. The family is diversified beyond the suspicion of those who have not given it particular study. The characteristics involved in this diversification are useful as generic characters whenever, in the evolution of the family, they have become fixed as attributes of natural groups conveniently to be treated as genera. The most careful study of these characteristics was that of Mettenius. Remembering always that naturalness is the indispensable criterion of a genus, and that characteristics are of systematic utility only as they serve to enable us to recognize natural groups,<sup>2</sup> some general discussion of the characters which are, or might be, useful in this family is in order.

The family as a whole is characterized by peculiarities: (a) Of the gametophyte, (b) of the reproductive structures of the sporophyte, (c) of the vegetative structures of the sporophyte.

The spores, so far as known, are uniform throughout the family. They are of the tetrahedral type, with three originally plane surfaces where they were in contact in the spore mother cell, and a convex face. The plane faces become convex, and the angle where they meet becomes inconspicuous. They contain chlorophyll, and commonly germinate very promptly. Most of our information as to the germination of the spores of different genera and species is due to the presence of young gametophytes in the sori of herbarium specimens. It has been assumed that their period of viability after dispersal is brief; but this is relative, and the assumption should be used very cautiously, in drawing conclusions against the possibility of their dissemination over stretches of ocean. The fact that they have so spread outweighs any antecedent improbability of their doing so.

Beginning with the germination of the spores, the gametophytes are known for so few species that it is unsafe to draw general conclusions. In the majority of observed cases the entire cell (spore) divides into three approximately equal cells; this occurs in *Trichomanes crispum*, *T. (Cardiomanes) reni-*

<sup>2</sup> De natuur kent geene karakters; zij brengt typen voort, wier wezen wij te erkennen en wier verwantschap wij te beoordeelen hebben naar het geheel harer bewerktuiging, zichtbaar in hetgeen wij habitus noemen.—van den Bosch, *Eerste Bijdrage* (1861) 303.

forme, *T. (Microtrichomanes) digitatum*, *H. (Mecodium) abruptum*, *H. (Mecodium) polyanthos*, *H. (Meringium) bivalve*, *H. taubridgense*, *H. (Mecodium) capillaceum*, *H. (Meringium) fusiforme*,<sup>9</sup> *H. (Mecodium) undulatum* (Hodwig, cited by Mettenius), *H. (Mecodium) surum* (Sadlebeck), *H. (Mecodium) dilatatum*, *T. (Microtrichomanes) palmatifidum*,<sup>10</sup> and *T. (Vandenboschia) draytonianum*.<sup>11</sup> In other cases three cells are cut off at the "corners" of the spore, leaving a larger central cell; this occurs in *T. (Vandenboschia) schmidianum* (Taschenr.), *T. (Crepidopteris) humile*, *T. (Vandenboschia) pyxidiferum* (Mettenius), and *T. (Gonocormus) diffusum* (Goebel).

The further development is known for still fewer species. As generalizations, in "*Hymenophyllum*" one of the three original outgrowths develops, after forming a short protonema, into a thalloid structure, one cell thick except along a narrow axis, bearing archegonia in clusters on cushions near the margin, and antheridia in various places. The species observed belong to *Hymenophyllum* and *Sphacrocionium*. *Cardiomanes* behaves in the same manner (Holloway); and so, I believe, does *Scraphiopsis*. In "*Trichomanes*" the protonema forms an extensively branched structure, ultimately producing thalloid structures which bear the archegonia on short special branches in *T. alatum* (Bower) and *T. sinuosum* (Goebel), or, without thallus, bearing such branches on the branched filament, in *T. (Vandenboschia) pyxidiferum*, *T. (Gonocormus) diffusum*, *T. (Selenodesmium) rigidum*, and *T. (Macroglena) strictum*. Holloway describes the gametophyte of *T. (Selenodesmium) elongatum*, which "has but a brief filamentous stage, and develops into a large strap-shaped tissue body whose meristem is situated at the base of a sinus at its forward end, the archegonia being borne on a series of cushionlike thickenings behind the meristem,"<sup>12</sup> whence it appears that this structure varies within *Selenodesmium*. There are a number of observations of other peculiarities. Mettenius reported exceedingly slow growth of the gametophyte of *T. pyxidiferum*; and there are other observations to the same effect. It seems to be of indefinitely long life, and in both known forms to be capable of vegetative multiplication by the dying off of old parts and independent survival of the branches. Infection

<sup>9</sup> Mettenius, *Hymen.* (1864) 469-491, pl. 4.

<sup>10</sup> Goebel, *Organographie* 2 (1930) 1069.

<sup>11</sup> Campbell, Moench and Fernald (1905) 373.

<sup>12</sup> Holloway, *Trans. N. Zeal. Inst.* (1923).

of the rhizoids by fungi has been observed for several species. A remarkable pitting of the walls is reported for one. The formation of gemmas seems to be general, and they are of at least two types. Both apogamy and apospory are reported. Goebel reports countless lateral antheridiophores outgrowths from the ribbonlike thallus of *T. (Didymoglossum) Krasaea*.

The paucity of these observations, and their indiscriminate distribution among the genera I recognize, makes it impossible at this time to use gametophytic characters for the characterization of the genera. With regard to the Polypodiaceae our information is more extensive, and, aside from the Vittaceae, there is such uniformity that the gametophyte is valueless in taxonomy. Among the Hymenophyllaceae so much diversity is known that more complete information seems likely to make the gametophyte very useful in an understanding of the evolution and in the correct classification of the group.

The division of the family into two genera has been based on the form of the involucre (indusium), supposed then to be composed of two mutually free "valves" in *Hymenophyllum* and to be a tube in *Trichomanes*. The condition ascribed to *Hymenophyllum* is lat. exists in many species of *Hymenophyllum* s. str. *Sphaerocionium*, and *Mecodium*. Since the involucre begins at the base of the receptacle, the valves are not free unless the whole sorus protrudes beyond the margin. It is usually more or less immersed, in which case there is at least the beginning of a tube. It is wholly immersed in *H. (Sphaerocionium) Lyallii*, leaving no free lips, so the species is moved to *Trichomanes*. *T. (Apteropteris) Malinigi*, equally without free valves, was moved in the other direction. Even if the sorus is not immersed, there is a tubular or obconic base in very many species called *Hymenophyllum*—Presl's *Meringium*, *Leptocionium*, and others. Conversely, two groups of "*Trichomanes*," *Crepidomanes* and *Didymoglossum*, have the mouth of the involucre divided into two lips, more deeply so in some species of *Crepidomanes* than in some species of *Meringium*. To provide for these very many species that do not conform to the definition of either genus, Presl and van den Bosch, who recognized many genera set up intermediate groups of genera, Sectio *Didymoglossum* Presl, and Tribus *Leptocioneae* van den Bosch.

At the base of the sorus the fertile vein may give rise to a branch running up each side of the tube, this phenomenon is observed in some but not in all species of *Mecodium*, *Meringium*,

and *Vandemboschia*. The tube is more than one layer of cells thick in *Trichomanes* s. str. but not in all groups of *Trichomanes* s. lat.; this difference merits detailed study.

The receptacle is typically included—that is, not longer than the involucre—in "*Hymenophyllum*," of indefinite length, by basal intercalary growth, in *Trichomanes*. In *Trichomanes* s. lat. there is uniformity of type, the globose tip and the inflated base on which respectively Presl based his genera *Cephalomanes* and *Hypoleutes* being illusory. The receptacle of *Acerophytum* and its derivatives and of *Leptocarpium* is like that of *Trichomanes*, indefinitely long. That of *Hymenophyllum* s. str. is of the same type but of limited growth, not typically exceeding the involucre. In *Mecodium* and *Spinervetionium*, growth ceases by the time the sporangia develop, the latter being simultaneous. *Somphites*, of Bower. In each of these genera there are natural groups of species with cylindrical receptacles, and others with more or less globose receptacles, all having longer or shorter sterile bases. These are illustrated for very many *Mecodium* species in my *Hymenophyllum*.<sup>12</sup> I place in *Mecodium* some American species with extruded receptacle. The sporangia may be sessile on the body of the receptacle, or may be borne on more or less prominent outgrowths, sporangiophores. Some species produce basal paraphyses.

The sporangia are uniform in type, sessile, with an obliquely transverse annulus interrupted by the stomium. In general they are large, with many superficial cells and up to 256 or 512 potential spores in *Hymenophyllum* s. lat.; small, with few superficial cells and comparatively few spores, in *Trichomanes* s. lat. Bower has studied these most amply, and concludes that species producing very numerous sporangia produce correspondingly small ones. However, *Cardiomanes* bears very long receptacles with indefinitely many sporangia as large as are known in any leptosporangiate fern.

In the range of modifications in vegetative form and structure in adaptation to a generally humid environment, the *Hymenophyllaceae* exceed any other family in the plant kingdom. This statement may astound those accustomed to the summary dictum that these are plants of very simple structure, but I make it with confidence. In a humid environment transpiration is limited. The leaf structure, evolved in perfect adaptation to the environment, then demands that the transpiration be lim-

<sup>12</sup> *Philipp. Journ. Sci.* 44 (1937) 1

ited, and the group is incapable of adaptation to constantly dry environment. In the internal economy of such plants the typical stem plays a minor part. It is a creeping rhizome bearing remote distichous fronds in most genera, this is the primitive stem of the family. In *Trichomanes* s. str., *Selenodesmum*, *Davalliopsis*, *Necopteris*, *Callistopteris*, and *Cephalomanes*, it shortens and is ascending or erect, with congested polystichous fronds. The bundle is of the concentric fern type. When, in stem or leaf, it becomes collateral, it does so by reduction, and these collateral bundles are not homologous with those of other plants.

Root bundles are usually diarch, but range from monarch to monarch. The most remarkable phenomenon as to the roots of the family is their disappearance. Mettenius found them absent in *T.* (*Vandenboschia*) *pyxidiferum* and *schmidianum*, *T.* (*Gonocormus*) *saxifragoides*, *T.* (*Crepidomanes*) *intramarginale*, *letemorguense*, and others. *T.* (*Microgonium*) *cuspidatum* and others. *T.* (*Didymoglossum*) *Petersii* and others, *T.* (*Lecanum*) *membranaceum*, and *T.* (*Crepidopteris*) *Arnoldi*. The number of species usually rootless is very large, but a root can occasionally be detected on species normally rootless. Rootlessness in general seems to characterize all of the genera just named in parent genera, with the exception of *Vandenboschia*.

In the absence of roots, stems take their place. These metamorphosed stems may be long, slender, freely branched, with suppression of the leaves. In substitution for root hairs, they produce rhizoids, cut off by a septum at the base. *Hymenophyllum* (*Mecodium*) *axillare* produces similar metamorphosed leafless stems, except that they bear roots. Besides the ordinary functions of absorbing liquid and anchoring the plant, the stout roots of old plants of *Trichomanes* s. str., *Cephalomanes*, and *Selenodesmum* serve as braces or props, to hold up the erect stems, which are not directly fixed in the ground.

The leaves vary from entire to fimbriate, many times dichotomous, and as many as five times pinnatifid. *Cardiomanes* and *Hymenophyllum* have simple fronds of considerable size, those of *Didymoglossum*, *Microgonium*, and *Craspedophyllum* are very small, even down to 6 mm or less long. The minute fronds of *Microgonium* and *Didymoglossum* are flat, not circinate, in vernation, unlike those of any other leptosporangiate ferns. Fronds up to several decimeters long are erect, in the genera with erect stems, or pendant in *Sphaerocarpum*, *Mecodium*, and *Vandenboschia*. The systems of branching in the axes of

the fronds are of the same types as in other ferns. Really reticulate venation occurs only in certain species of *Trichomanes*. A marginal vein connects the ends of the veins in most species of *Microgonium*. Besides veins with the usual structure, "false veins" occur. These are placed like veins, and may represent reduced or aborted veins, in *Trichomanes* s. str. spp., *Didymopanax*, *Lecanum*, and in part in *Microgonium*, or they are structures sui generis in no way related to real veins, in *Crepidomanes* and in part in *Microgonium*. These are sometimes distinguished as strim. There are also marginal structures, presumably protective, loosely spoken of as false veins, characteristic of *Pleuromanes*, *Crepidopteris*, *Craspedophyllum*, and *Hymenophyllum*. The elements of the strim of *Crepidomanes* are like those surrounding the axes and forming sclerenchymatous sheaths. They are silicified, and in structure are peculiar to the family; Mettenius named them "Deckzellen," 'lateral cells.'

The family is commonly defined as having the lamina a single cell thick. This is true in general, and precludes the differentiation of the tissues and tissue systems characteristic of other vascular plants. *Cardiomanes* and *Davallopsis* have leaves uniformly three, four, or five cells thick, as do also *H.* (*Mecodium*) *dilatatum* and *scabrum*. In these cases the superficial cells are essentially like those of the family in general, and the differentiation of the internal cells does not extend beyond some difference in size, and the absence of chlorophyll. There are no intercellular spaces. I do not regard these thick leaves as primitive, but agree with Goebel that they are "tertiary" modifications. Fairly conclusive ontogenetic evidence to this effect is presented by Holloway.<sup>1</sup> The colorless internal cells, without intercellular spaces, would surely not be expected in an intermediate evolutionary stage between the leaf of any ordinary fern and that of *Hymenophyllum*. There are a considerable number of known cases of fronds partly two cells thick. This discussion applies only to the parenchymatous cells, strim and specialized margins are commonly two or more cells thick.

There are remarkably specialized cell walls, which sometimes serve to characterize genera. Remarkable corner-bordered pits of essentially the same general design are found in *Sclerodesmium* and *Merriamium*, with exceptions that may be primitive

<sup>1</sup>Trans. N. Z. Inst. 16 (1923) 527

in New Zealand but are almost surely tertiary in Malaya. Similar walls occur in some species of *Macroglena*. The most remarkable plant in the family, in the structure of its walls and the form and arrangement of its cells, is *Abrodietyan*.

As to the cell contents, van den Bosch has described them in general terms for a great number of species, but his data have not been found available for the characterization of groups. *Sphaerocarpum*, so far as the species have been tested, is remarkable for very small and numerous chromolophores. Remarkably large cells characterize *T.* (*Vandenboschia*) *philippianum* and most species of *Macroglena*, those of *Cephalomanes* also are large.

This is not an exhaustive list of the morphological peculiarities exhibited by members of the family, still less of the groups and species which demonstrate them. Most of our information up to date is the work of Mettenius, comparatively little having been added by Prantl, Giesenhagen, Boodle, Bower, Campbell, and other successors—somewhat more by Goebel.

One of the most unique such features shown by any genus is the loss of distinction between rhizome and stipe in *Gonocarpus*. With this exception, proliferation by the frond is rare in the family, confined to *Trichomanes* s. str. and its derived genus *Foss*.

The trichomes of the family merit a separate paragraph, having a taxonomic value which has been too little appreciated. Hairs of one, two, or more cells protecting the apices of stems and very young leaves are general in the family and are usually caducous. They may seem to be attached above the base, and in this case have been called paleae. Club-shaped bicellular hairs are more persistent in *Nesopteris*, and fringe the mouth of the involucre of two species. Long, soft hairs are common enough to be characteristic of *Trichomanes* s. str. and *Heringium*. In *Pleuromanes* they are borne on the broad axinal pad but not on the unilaminar "parenchyma." Large, stalked, stellate trichomes characterize *Sphaerocarpum*, and their modifications are characteristic of the minor groups of that genus. Their stalk cells may disappear, leaving a sessile, stellate cluster of setae. By further reduction these setae become paired, and finally single. Such setae persist on some, not all, species of the derived genus *Microtrichomanes*. They occur also on *Didymoglossum*, but not on *Microgonium*, whether or not the latter has a marginal vein.

leaves pale, superficially expanded in chlores, such as characterize the *Cyathea-Dryopteris* *Matrella-Polypodium*, and *Oleandra Davallia* phyla of Polypodiaceae, are unknown in Hymenophyllaceae. The structures so constituted in *H. (Bucia)* *merisema* are mostly cut-off fragments of the coriaceous wing of the axis, as was recognized by Presl in the case of *H. (Pluchophyllum)* *plicatum*.<sup>1</sup> "Stipes bifarie palens is vel plicatus marginibus frondis utriusque in densis acuminales plicis formibus discoluto instructus." One New Guinea species of the *Merisema* group, with much eroded (overfold, plicate) lamina has the whole of the wing of the frond broken up in this manner. It is thus destitute of any venulose green lamina area, a condition so remarkable that I have tried to give it adequate emphasis by constituting it a genus (*Hypocladon*) although its relation to *Merisema* is perfectly clear. There is a better known and repeatedly illustrated derivative of *Sphaerocarpum*, whose photosynthetic area consists of innumerable short filaments standing out in all directions from the axes; this also is worthily treated as a genus (*Apteranteris*).

While adaptation to a humid environment is the general principle in the evolution of this family, the fact is not to be overlooked that a large part of them are epiphytes, and that epiphytes in general are of necessity able to endure temporary dryness. Polypodiaceous epiphytes, as a general rule, are structurally equipped to retain water during temporary outside dryness, but such structural equipment is comparatively rare in Hymenophyllaceae. The colorless internal cells of *Cephaelomanes reniforme*, *H. dilatatum*, and *H. scabrum* seem to serve for water storage. The hairy covering of many species of *Sphaerocarpum* is a protection against loss of water. *H. (Apteranteris)* *Malayana* is the one plant in the family structurally apparently highly modified to live as an exposed epiphyte. As Giesenhagen emphasized there are devices of form by which liquid water is conserved outside the leaf.

Most commonly, as I pointed out long ago, the epiphytes of this family are fitted to their environment by enduring the loss of water, as do the mosses, and still more perfectly the lichens. In my experience most species change their form during desiccation, but Holloway<sup>16</sup> reports that *H. rarum* and *H. flabellatum*, and even the prothallia of the former, remain unchanged while

<sup>1</sup> Hymenophyllaceae (1843) 121.

<sup>16</sup> Trans. N. Z. Inst. 54 (1922) 591.



the moss they grow in curls up with dryness. Shreve<sup>1</sup> has reported concentration of the cell sap amounting to nearly or quite half-normal salt.

The bad state of the nomenclature of these plants has been remarked upon repeatedly, sometimes by those who contributed to the evil. Thus Prantl<sup>2</sup> could note "die in einem heillosen Zustande befindliche Synonymik," but deliberately reject *Foca* and *Cephalomanes* in favor of later names. Giesenhagen described the taxonomic of a part of the family as "eine ausserordentliche Verwirrung," and "ein wirres Durcheinander."

I have tried to bring order into the generic nomenclature by a scrupulous observance of the accepted rules, the essential principle of which is that any group now treated as a genus must bear the oldest tenable generic name of any species now included in it. Such a species is the type species of the genus, and the generic name cannot be dissociated from it. This rule is exceptionally easy to apply in this family because the older and larger genera were mostly described originally, each with a single species, leaving no chance for difference of opinion as to the type.

The generic names proposed for these plants are shown in chronological order, by the following enumeration. For convenience I include, but indent, the names imperfectly proposed for genera, or proposed for groups of infragenic rank. The type species is given in each case. The genera retained are in boldface type.

**Trichomanes** Linnæus (1757). *T. crispum*.

*Pyndora* Gleditsch (1761). (This name has no status at all.)

**Achomanes** Necker (1790) = *Trichomanes*.

**Hymenophyllum** Smith (1793). *H. tuxbridgense*.

*Pageomanes* Hedwig (1800) = *Hymenophyllum*.

**Foca** Bory (1824). *F. novæ* Bory = *P. botryoides* (Kaulf.) v. d. B.

**Hymenostichus** Bory (1824). *H. elegans* (Rudzo) = *Trichomanes diversifrons* (= *Foca*).

**Didymoglossum** Desaux (1827). *D. macroloides* Desx. (= *Trichomanes hymenodes*).

**Leranium** Presl (1843). *L. membranaceum* (L.) Presl.

**Cardomanes** Presl (1843). *C. uniformis* (Forster) Presl.

**Achomanes** Presl (1843) = *Trichomanes*.

**Entrichomanes** Presl (1843). Included spp. of *Didymoglossum*, *Sphaerocoma*, *Gonocormus*, *Crepidomanes*, and many others, but not *Trichomanes crispum*.

<sup>1</sup> Bot. Gaz. 51 (1911): 204.

<sup>2</sup> Hymenophyllaceæ (1875) 53.

- Pachyactum* Presl (1843). *Trichomanes luschianum* Presl = *T. ruscifolium*.
- Ragadietum* Presl (1843). *R. erianthum* (Sw.) = *Trichomanes*.
- Cephalomanes* Presl (1843) = *C. atrocinereum*.
- Neurophyllum* Presl (1843), non T & G (1840). *N. Vittaria* (D. C.) = *Trichomanes*.
- Microgonium* Presl (1843) = *M. cuspidatum* (Willd.).
- Abrodia* van Presl (1843) = *A. Cumingii* (= *Habrodictyon* Presl v. d. B.).
- Chlodion* Presl (1843) = *D. Neesii* (Blume) = *Meringium*.
- Crepidium* Presl (1843), non Blume 1825. *D. humile* (Forster) = *Crepidopteris*.
- Meringium* Presl (1843) = *M. Meringianum*.
- Hemiplebium* Presl (1843) = *H. pusillum* (Sw.) = *Didymopogon*.
- Leptocarpum* Presl (1843). *L. dicranopteris*.
- Alismacarpum* Presl (1843). = *M. tortuosum* = *Meringium*.
- Psychophyllum* Presl (1843) = *P. plicatum* = *Meringium*.
- Sphaerodictyon* Presl (1843) = *Hymenophyllum Wilsoni* Hooker.
- Euhymenophyllum* Presl (1843), incl. *Hymenophyllum lunbridgensis*.
- Cycloglossum* Presl (1843) = *Hymenophyllum caespitosum* Gaud. = *Serpyllopsis*.
- Crausodophyllum* Presl (1843) = *Hymenophyllum marginatum*.
- Sphaerocarpum* Presl (1843) = *S. nigratum* (Sw.).
- Hymenocarpum* Presl (1843) = *H. truncatum* (Cav.).
- Heteropteris* Presl (1843). *H. heterophylla* (H. B. W.) = *Presl*.
- Macrocarpum* Presl (1843). *Trichomanes meifolium*.
- Pseudochromolaena* Presl 1849-1851) = *Trichomanes s-nigrum* Rich. = *Trichomanes*.
- Odontomanes* Presl (1849-1851) = *O. Hostmannianum* (Kl.) = *Trichomanes*.
- Crepidomanes* Presl (1851). *C. intramarginata* (H. & G.).
- Pleuromanes* Presl (1851) = *P. acutum*.
- Tachmanis* Presl (1851). *T. Fillicula* (Bory) = *Crepidomanes*.
- Leucomanes* Presl (1851) = *L. album* (Blume) = *Pleuromanes*.
- Amphipteris* Presl (1851) = *A. fuscum* (Blume).
- Mecodium* Presl (1851). *M. sanguinolentum* (Forster).
- Dermatophyllum* Presl (1851). *D. tomentosum* (Kze.) = *Sphaerocarpum*.
- Neuromanes* Trevisan (1851) = *N. affine* = *Trichomanes Hostmannianum*.
- Tetralasma* Philippi (1860) = *Hymenophyllum quadrifidum*.
- Crausodactylon* van den Bosch (1859-1861). *C. album* (Blume) = *Pleuromanes*.
- Luticodactylon* van den Bosch (1859), non J. Sm. (1841). *Trichomanes venosum*.
- Serpyllopsis* van den Bosch (1859-1861) = *S. antarctica* = *S. caespitosa* Gaud., C. Chr.
- Diplophyllum* van den Bosch (1859-1861), non *Diplophyllum* Lehm (1814). = *Hymenophyllum dilatatum* = *Mecodium*.
- Genocarpum* van den Bosch (1861). *G. minus* (Blume).
- Adiantopsis* van den Bosch (1861), non Fee (1850).
- Devallopsis* van den Bosch (1861).

*Trichomanes*  
*Prickum* T.  
*elegans*.

- Lacostea* van den Bosch (1861), Prantl (1875) *Trichomanes* Ankersen = *Trichomanes*
- Maschkeosorus* van den Bosch (1861). *M. Mougeotii* v. d. B. — *Fern. o-mundoides*.
- Plethophyllum*, van den Bosch (1861), non *Plethophyllum* Nees (1842). *Trichomanes venosum* = *Polyphegium*.
- Ptilophyllum* van den Bosch (1861); Prantl (1875) non alterum prior. = *Trichomanes*.
- Pachyloma* van den Bosch (1861), non D. C. (1828). *Hymenophyllum marginatum* = *Craspedophyllum*.
- Trigonophyllum* Prantl (1875). *Ptilophyllum Boncroftii* = *Trichomanes arbuscula*.
- Acarpachium* Prantl (1875). *Ptilophyllum pilodes* = *Trichomanes autum*.
- Leptomanes* Prantl (1875). *Trichomanes tenerum* Spr. = *Vandenboschia*.
- Lucoctropis* Prantl (1875) *Trichomanes "radicans Sw" - I* v. *pastra* (?)
- Selenodesmium* Prantl (1875). *Trichomanes rigidum*.
- Helophlebium* Christ (1897)
- Hemiyathoon* Domin (1913). *Hymenophyllum Batkyanum*.
- Acanthozoea* Nakai (1926), non D. C. (1827) *Hymenophyllum acanthoides* = *Meringium*.
- Bueria* Morton (1932). *Hymenophyllum miriflorum*.
- Myriodon* Copeland (1936) *Hymenophyllum edentophyllum*.
- Anteropteris* Copeland (1936). *Hymenophyllum malinzi*.

*Artificia. key to the genera of the Hymenophyllaceae.*

Keel lamina wanting, and replaced

By filaments cells ..... 5. *Anteropteris*.

By veinless teeth ..... 10. *Myriodon*

Typical lamina present.

Involucre valvate.

Margin entire and naked.

Frond large, simple ..... 14. *Hymenoplasium*.

Frond minute, simple ..... 2. *Craspedophyllum*.

Frond pinnately divided.

Accessory wings present ..... 9. *Amphipterum*.

Accessory wings absent.

Wax thick, coarsely pitted. .... 8. *Meringium* spp.

Wax not coarsely pitted

Fronds pinnate, axes red-pilose. 13. *Serpillipsia*

Fronds more compound or without red hairs

Base of involucre cyathiform, receptacle ex-

serted. .... 3. *Hemiyathoon* (*Bolleanium*)

Base of involucre not cyathiform or receptacle

included ..... 1. *Macrodium*.

Margin hairy

Receptacle included ..... 4. *Sphaerocrasionium*

Receptacle long-exserted ..... 12. *Leptocrasionium*.

## Margin toothed.

Receptacle long-exserted.

Accessory wings present..... 9. *Amphipterum*.

Accessory wings wanting.

Base of involucre obconic ..... 8. *Microgramma*.

Base of involucre cylindrical form.

3. *Hemiothyrium* (*Dephenei*).

Receptacle not long-exserted.

Receptacle cylindrical or clavate. (Cf. also *Mercurialis*  
*Reinwardtii* and others.) ..... 7. *Hymenophyllum*.Receptacle unilobose ..... 11. *Alisma*.

Involucre tubular or obconic, not valvate.

Rhizome filiform, fronds remote.

False veinlets present.

Fronds pinnately divided or compound.

False veinlets in the position of veins.

28. *Dalmanodroma*.False veinlets unrelated to veins... 21. *Crepidomanes*.

Fronds simple or lobed.

With marginal vein ..... 22. *Microgramma*.

Without marginal vein.

Without marginal scales. 23. *Dalmanodroma*.With marginal scales ..... 24. *Lecanodroma*.

False veinlets absent.

Fronds marginate.

With hairy axist pads ..... 19. *Pleurozium*.Naked, without axist pads ..... 20. *Crepidopteris*.

Fronds not marginate.

Axes of fronds profliferous ..... 19. *Genocarpus*.

Axes not profliferous.

Veins branched within segments.

17. *Polypodium*.

Segments one-nerved.

Fronds dichotomous or simple.

6. *Antrodiaetum*.

Fronds pinnate in plan.

Axes coarsely red-pilose.

13. *Serpyllaria*.

Axes not red-pilose.

16. *Vandenboschia*.

Rhizome stout or fronds clustered.

Cells transversely elongate ..... 30. *Abrodictyum*.

Cells not transversely elongate.

Fronds simple ..... 15. *Caridinanthus*.

Fronds once pinnate.

Oriental ..... 25. *Cephaelis*.

American.

Fronds not dimorphous ..... 26. *Trichomanes*.

Fronds dimorphous.

Sterile fronds pinnate ..... 26. *Trichomanes*.Sterile fronds pinnatifid ..... 27. *Foca*.

Fronds more divided.

Segments stiff and very narrow ..... 32. *Macroglena*.

Segments broader or soft.

Rhizome creeping, fronds remote.

Fronds soft in texture. (Cl. as *Trichomanes* *impetrate* and others.)

16. *Vandenboschia*.

Fronds harsh - ..... 30. *Scopodesmium*.

Fronds clustered.

Fronds 1 cell thick.

Walls thick, coarsely pitted.

30. *Selaginella*.

Walls not coarsely pitted.

American ..... 28. *Trichomanes*.

Palmotropic.

Stipes bristly.

23. *Callistopteris*.

Stipes not bristly

24. *Neopteria*.

Fronds thicker

31. *Davallopsis*.

#### 1. Genus *MECODIUM* Presl

*Mecodium* Presl, Epim. Bot. (1852 \*) 258, Nomen.

*Diptophyllum* VAN DEN BOSCH, *Essai de Botanique* (1861) 322, non *Diptophyllum* Lohm. (1844)

*Hymenophyllum*, § *Euthymenophyllum* *unc. par.* *see cit.*

*Hymenophyllum*, § *Sphaerocarpum* *unc. par.*, C. Chr. *Suppl. Text.* 1934)

Analoga Ple. roman. in Hymenophyllaceis existant plura nomen inter Hymenophylloidas *Mecodium sanguinolentum* (Hymenophyllum sanguinolentum Swartz) — Presl, *loc. cit.*

Epiphyllaeae, rhizomate gracile, frondibus remotis, mediocribus vel majoribus, pinnatum decompositis, marginibus integris nudis, parietibus cellularum typice tenuibus, soris pantotactis, involucris aut ad basim aut usque ad laminam frondis bivalvibus, receptaculo incluso.

Type *M. sanguinolentum* Presl. (*Trichomanes sanguinolentum* Forster).

A pantropic and austral genus of about 100 recognized species, the largest genus of the family.

This genus as a whole has remained without a name, first because both Presl and van den Bosch failed to grasp it, leaving it partly or largely in *Hymenophyllum*, and later (beginning with van den Bosch) because it was wrongly construed as *Hymenophyllum* by those who recognized *H. timbridgense* as foreign to it, and assigned that species to *Leptacnium*.

Presl certainly did not adequately describe his genus *Mecodium*. His description would be inaccurate, even if what he wrote were correct, which it is not. He misconstrued the axial pads of *Pleuromenes* and there is nothing to justify the statement as to *M. sanguinalentum*, more than as to most species of the family, that it is "analogous" to *Pleuromenes* as the latter is, still less as he thought it to be. I adopt his generic name because it exists, and its use is preferable to the invention of a new name. The only other generic name proposed for any of these ferns is *Diplophyllum*, invalidated under present rules by *Diplophyllum* Lehm. (1814).

Like *Heringium* and *Vanilbuxchia*, *Mecodium* includes aberrant species in the far South, vestiges as I picture the case, of a flora antedating the present evolution of the family, with these genera satisfactorily uniform in the Tropics of both hemispheres. In the Tropics and in the Southern Temperate Zone, with the exceptions just noted, *Mecodium* is one of the most uniform and easily recognized of large genera. Within it are groups common to the two hemispheres—whether because of transoceanic migration or because of separate descent from common Antarctic ancestors, I do not guess. Certainly, however, *M. badium* and *M. \* ensiculatum* are more nearly related to one another than either is to *M. polyanthos*. In both hemispheres, receptacles, elongate or globose or otherwise dilated, with or without sporangiophores, characterize groups of species; but these differences are so gradual, from species to species, that it would be impracticable (as well as, I believe, unnatural) to use them, as Presl attempted, as generic criteria. This seems to me true also of the branching of the bundle at the base of the sorus, to which van den Bosch attached supergeneric significance, it is conspicuous in *M. rurum* and some relatives, and in occasional other plants, including forms of *M. polyanthos* which I do not distinguish specifically.

Laminae more than one cell in thickness are a far more remarkable peculiarity. I use them to characterize *Davallopsis* and *Cardiomanes*, but do not recognize a genus *Diplophyllum*, partly for the reason advanced by Mettenius, that besides fronds wholly thick (when mature and on adult plants) there are

\* These combinations are made in the list of species, immediately following; their use here in anticipation does not constitute publication, and is less awkward than citation under older names.

others in *Mecodium* which are partially so (*M. acutissimum*, *M. australe*), so that the distinction is not a sharp one, but more than this, it is because the several species with thick leaves seem independently related to species of the typical family structure, which makes it impossible to combine as a genus the two known species with fronds usually thick throughout.

Included in *Mecodium* are three species, *M. Reinwardtii*, *M. thundrum*, and *M. samoense*, with toothed margin. This margin is denticulate rather than serrulate, and the teeth do not appeal to the eye as the same as those of *Meringium*. *M. thundrum* has little fronds crisped in a degree reminiscent of *Meringium acanthoides*. I have invoked intergeneric hybridization to explain some such resemblances, but in this case do not believe that any affinity exists. It may be recalled that a series of *Meringium* species has entire margins.

## SPECIES OF MECODIUM

**MECODIUM POLYANTHOS** (Swartz) Copeland comb. nov.

*Trichomanes polyanthos* SWARTZ, Prod. Fl. Ind. Oce. (1788) 127.

*Hymenophyllum polyanthos* Swartz. COPLAND, Hymen. (1937) 97, pls. 46-47.

Pantropic with very many synonyms.

**MECODIUM KUHNII** (L. Christensen, Copeland comb. nov.

*Hymenophyllum kuhnii* L. CHRISTENSEN, Index (1905) 363, Copeland, Hymen. (1937) 106, pl. 48.

*Hymenophyllum Mageri* KUHN, non Presl.

Tropical Africa

**MECODIUM PANICULIFLORUM** (Presl) Copeland comb. nov.

*Hymenophyllum paniculiflorum* PRESL, Hymen. (1842) 147, Copeland, Hymen. (1937) 110, pl. 51.

PHILIPPINES; BORNEO; JAVA.

**MECODIUM NITIDULOIDES** Copeland.

*Hymenophyllum nitiduloides* COPLAND, Hymen. (1937) 112, p. 52.

LUZON.

**MECODIUM OVIDES** (F. v. M. and Baker) Copeland comb. nov.

*Fiss. neophytum ovides* F. v. M. and BAKER, Journ. Bot. 28 (1890) 105; COPLAND, Hymen. (1937) 107.

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**MECODIUM SANGUINOLENTUM** (Foster) Presl.

NEW ZEALAND.

*MECODIUM RECURVUM* (Guss.) Copeland comb. nov.

*Hymenophyllum recurvum* GAUMCHALE, Freyc. Voy. Bot. (1827) 776,  
COPELAND, Hymen. (1937) 108, pl. 40.

## HAWAII

*MECODIUM PRODUCTUM* (Kuhn) Copeland comb. nov.

*Hymenophyllum productum* KUNZE, Bot. Zeit. 8 (1848) 309; COPELAND,  
Hymen. (1937) 113, pl. 51.

## JAVA; SUMATRA, BORNEO, PHILIPPINES

*MECODIUM TOBIASPOLNSSE* Kuhn.

CELEBES. Differs from *M. productum* in having a wingless  
stipe.

*MECODIUM ANG. LOSEUM* (L. Kuhn) Copeland comb. nov.

*Hymenophyllum angulosum* CHEN ET. Philip Journ. Sc. 5 (1908)  
269; COPELAND, Hymen. (1937) 109, pl. 50.

## PHILIPPINES.

*MECODIUM REYNARDII* (Van der Burgh) Copeland comb. nov.

*Hymenophyllum Reynardii* VAN DER BURGH, Pl. Jough. I (1860)  
567; Hymen. Java. 22, pl. 32; COPELAND, Hymen. (1937) 110, pl.  
55.

## MALAY ISLANDS

*MECODIUM TRIVIDUM* (Horn) Copeland comb. nov.

*Hymenophyllum trividuum* HORN, Journ. Linn. Soc. Bot. 16  
(1877) 23; COPELAND, Hymen. (1937) 116, pl. 56.

## PHILIPPINES; NEW GUINEA.

*MECODIUM SAMUENSE* (Hook.) Copeland comb. nov.

*Hymenophyllum samuense* BAKER, Journ. Bot. 1876) 10; COPELAND,  
Hymen. (1937) 117, pl. 57.

## SAMOA; FIJI; QUEENSLAND.

*MECODIUM EMARGINATUM* (Swartz) Copeland comb. nov.

*Hymenophyllum emarginatum* SWARTZ, Bot. Voy. Jour. 1801) 101,  
Synopsis 148, 277; COPELAND, Hymen. (1937) 118, pl. 58.

## MALAY ISLANDS, NEW CALEDONIA,

*MECODIUM JAVANICUM* (Spr.) Copeland comb. nov.

*Hymenophyllum javanicum* SPR., Syst. Veg. IV (1827) 132; COPELAND,  
Hymen. (1937) 120, pl. 60.

## Ceylon to New Caledonia and Eastern Australia

*MECODIUM PRODUCTOIDES* (J. W. Moore) Copeland comb. nov.

*Hymenophyllum productoides* J. W. MOORE, Bishop Mus. Bull. 102  
(1933) 5.



## SOCIETY ISLANDS.

*MECODIUM FIMBRIATUM* (J. Sm.) Copeland comb. nov.

*Hymenophyllum fimbriatum* J. SM. Hooker's Journ. Bot. 3 (1841) 418,  
Species Fil. I (1844) 102, p. 360, COPELAND, Hymen. (1937) 122,  
pl. 60.

## PHILIPPINES.

*MECODIUM RICHIEI* (Christ) Copeland comb. nov.

*Hymenophyllum richiei* CHRIST, Ann. Cons. Jard. Bot. Geneva 4  
(1900) 208, COPELAND, Hymen. (1937) 123, pl. 61.

## LOOCHOO ISLANDS.

*MECODIUM CORRUGATUM* (Christ) Copeland comb. nov.

*Hymenophyllum corrugatum* CHRIST Bull. Boiss. II 3 (1903) 502,  
COPELAND, Hymen. (1937) 124.

## Western China.

*MECODIUM FLABELLATUM* (La Bill.) Copeland comb. nov.

*Hymenophyllum flabellatum* LA BILL., Nov. Holl. Pl. 2 (1806) 101  
pl. 260, fig. 1; COPELAND, Hymen. (1937) 125, pl. 62.

## New Zealand to Queensland and Tahiti.

*MECODIUM RUFESCENS* (Kuhn) Copeland comb. nov.

*Hymenophyllum rufum* ex Kuhn, Trans. N. Z. Inst. 13 (1870) 467  
pl. 194, COPELAND, Hymen. (1937) 126.

## NEW ZEALAND.

*MECODIUM LE RAINI* (Rea) Copeland comb. nov.

*Hymenophyllum Le Raini* ROSENSTOCK, Fodde's Report. 9 (1910) 71  
COPELAND, Hymen. (1937) 127, pl. 63.

## NEW CALEDONIA

*MECODIUM RABUM* (R. Br.) Copeland comb. nov.

*Hymenophyllum rabum* R. BRONKH. Fl. N. Ho I. (1810) 159 COPELAND  
Hymen. (1937) 128, pl. 64.

## NEW ZEALAND; AUSTRALIA.

*MECODIUM INVOLUCRATUM* Copeland.

*Hymenophyllum involucratum* COPELAND, Univ. Calif. Publ. Bot. 12  
(1931) 375; Hymen. (1937) 128 pl. 65.

## RAROTONGA.

*MECODIUM WATLIFI* (M. and B.) Copeland comb. nov.

*Hymenophyllum Watliffi* MADDEN and BITCHE, Proc. Linn. Soc. N. S.  
Wales 35 (1910) 802, COPELAND, Hymen. (1937, 130, pl. 66.

## QUEENSLAND.

**MECOBIUM ANTHIDES** (Baker) Copland comb. nov.

*Hymenophyllum anthides* BAKER, Syn. Fil. (1873) 51, COPELAND, Hymen. (1937) 131 pl. 67.

#### NEW CALEDONIA

**MECOBIUM MONTANUM** (Kuhn) Copland comb. nov.

*Hymenophyllum montanum* KUHN, Trans. N. Z. Inst. 10 (1877) 394 pl. 218, COPELAND, Hymen. (1937) 121, pl. 68.

#### NEW ZEALAND.

**MECOBIUM INTRICATUM** (van den Bosch) Copland comb. nov.

*Hymenophyllum intricatum* VAN DEN BOSCH, Ned. Kr. Arch. 53 (1903) 169, COPELAND, Hymen. (1937) 132.

#### TASMANIA.

**MECOBIUM FUMARIODES** (Willdenow) Copland comb. nov.

*Hymenophyllum fumarioides* WILLDENOW, Sp. Plant. 5 (1809) 536, COPELAND, Hymen. (1937) 132.

#### South Africa and East African Islands.

**MECOBIUM HUMILIS** C. Chr. Copland comb. nov.

*Hymenophyllum humile* C. CHR. ST. Arch. Bot. 2 (1925) 200; Dansk Bot. Arkiv. 7 (1932) 10, pl. 2, figs. 6-8, COPELAND, Hymen. (1937) 130.

#### MADAGASCAR

**MECOBIUM VERONICOIDEUM** C. Chr. Copland comb. nov.

*Hymenophyllum veronicoideum* C. CHR. ST. in Donnay, Notes Pterid. 12 (1920) 20; Pterid. Madag. 9 pl. 2, figs. 3-12, COPELAND, Hymen. (1937) 135.

#### MADAGASCAR

The preceding nine species constitute a well-defined group.

**MECOBIUM INBRICATUM** (Blume) Copland comb. nov.

*Hymenophyllum inbricatum* BLUME, Enum. (1828) 229, COPELAND, Hymen. (1937) 137 pls. 70, 71.

#### MALAYA, POLYNESIA.

**MECOBIUM TREUBII** (Kuhn) Copland comb. nov.

*Hymenophyllum Treubii* RACHOWSKI, Pterid. Bucl. (1898) 15, COPELAND, Hymen. (1937) 140, pl. 72.

#### JAVA; NEW GUINEA; PERAK?

**MECOBIUM JUNGKUNNI** (van den Bosch) Copland comb. nov.

*Hymenophyllum Jungkunni* VAN DEN BOSCH, Pl. Jaugh. 1 (1856) 570, Hymen. Javan. 59, pl. 49, COPELAND, Hymen. (1937) 142, pl. 73.

#### JAVA; SUMATRA; BORNEO.

**MECOBIUM LONGIFOLIUM** (v. A. v. Rosenburgh) Copeland comb. nov.

*Hymenophyllum longifolium* VAN A. v. ROSENBURGH Bull. Jard. Bot. Bot. (16) II (1914) 17; COPELAND, Hymen. (1937) 143, pl. 74.

CELEBES; PAPUA; JAVA?

**MECOBIUM SALAKENSE** (Rachowaki) Copeland comb. nov.

*Hymenophyllum salakense* RACHOWSKI, Pterid. East. (1898) 18; COPELAND, Hymen. (1937) 143, pl. 75.

JAVA; SUMATRA; BORNEO?

**MECOBIUM BADIUM** (H. and G.) Copeland comb. nov.

*Hymenophyllum badium* HOOKER and GREVILLE, Icones Fil. (1828) p. 70; COPELAND, Hymen. (1937) 144, pl. 76.

India to Formosa and Celebes.

**MECOBIUM CRISPATUM** (Walp.) Copeland comb. nov.

*Hymenophyllum crispatum* Walp. in HOOKER and GREVILLE, Icones Fil. (1828) pl. 77; COPELAND, Hymen. (1937) 148, pl. 77.

India to the Philippines.

**MECOBIUM CRISPATO-ALATUM** (Hayata) Copeland comb. nov.

*Hymenophyllum crispato-alatum* HAYATA, Icones pl. Formosan. 5 (1915) 256; COPELAND, Hymen. (1937) 149, pl. 79.

FORMOSA.

**MECOBIUM FLEXILE** (Makino) Copeland comb. nov.

*Hymenophyllum flexile* MAKINO, Bot. Mag. Tokyo 13 (1899) 46; COPELAND, Hymen. (1937) 150, pl. 80.

JAPAN.

**MECOBIUM SPACUM** Copeland.

*Hymenophyllum spacum* COPELAND, Hymen. (1937) 151, pl. 81.

NEW GUINEA.

The preceding ten species are a natural group, with American relatives.

**MECOBIUM WRIGHTII** (van den Bosch) Copeland comb. nov.

*Hymenophyllum Wrightii* VAN DEN BOSCH, Synopsis (1859) 31<sup>2</sup>; COPELAND, Hymen. (1937) 152, pl. 82.

JAPAN.

**MECOBIUM EXERTUM** (Walp.) Copeland comb. nov.

*Hymenophyllum exertum* WALP. in Hooker, Spec. Fil. I (1844) 109, pl. 38A; COPELAND, Hymen. (1937) 153, pl. 83.

INDIA; CHINA; SIAM.

<sup>2</sup> The page citation is that of the reprint to get the pagination in Ned. Kr. Arch. 4 add 240.

**MECODIUM FLEXUOSUM** A. Cunn. Copeland comb. nov.

*Hymenophyllum flexuosum* A. Cunningham, Nouv. Ess. Comp. Bot. Mar.  
2 (1836) 367; COPELAND, Hymen. (1937) 154 pl. 84

# NEW ZEALAND

**MECODIUM VULCHERIANUM** M. Collins. Copeland comb. nov.

*Hymenophyllum pulcherrimum* COLENSO, Tasm. Journ. Nat. Sci. 2  
(1844) 185; COPELAND, Hymen. (1937) 150

# NEW ZEALAND.

**MECODIUM VILLOSUM** (Carruth) Copeland comb. nov.

*Hymenophyllum villosum* COLENSO, Tasm. Journ. Nat. Sci. 2 (1844)  
185; COPELAND, Hymen. (1937) 157

# NEW ZEALAND.

**MECODIUM ALSTRAE** (W. Meisner) Copeland comb. nov.

*Hymenophyllum alstrae* WILDELOW, Spec. Pl. 5 (1816) 627; COPE-  
LAND, Hymen. (1937) 158, pl. 85.

# TASMANIA; NEW ZEALAND; VICTORIA?

**MECODIUM DEMISSUM** (Forster) Copeland comb. nov.

*Trichomanes demissum* FORSTER, Prod. (1786) 85.  
*Hymenophyllum demissum* Swartz, COPELAND, Hymen. (1937) 159,  
p. 86.

# NEW ZEALAND.

**MECODIUM DILATATUM** (Forster) Copeland comb. nov.

*Trichomanes dilatatum* FORSTER, Prod. (1786) 85.  
*Hymenophyllum dilatatum* Swartz, COPELAND, Hymen. (1937) 160, pl.  
87.

# NEW ZEALAND

**MECODIUM SCABRUM** (A. Rich.) Copeland comb. nov.

*Hymenophyllum scabrum* A. RICHARD, Fl. Nouv. Zel. (1832) 90, COPE-  
LAND, Hymen. (1937) 161, pl. 87.

# NEW ZEALAND.

**MECODIUM CINERATUM** (Kunze) Copeland comb. nov.

*Hymenophyllum cineratum* KUNZE, Anal. (1827) 50.

CHILE; JUAN FERNANDEZ. *H. Darwini* (Hooker) v. d. Bosch  
must belong here.

**MECODIUM TRIANAII** (Hieron.) Copeland comb. nov.

*Hymenophyllum Trianae* HIERON., Bot. Jahrb. 24 (1904) 429.

From Bolivia to Colombia

**MECODIUM MULTIFLORUM** (Benth) Copeland comb. nov.

*Hymenophyllum multiflorum* ROSENSTOCK, Meded. Rijksh. Herb. Leyden  
No. 19 (1913) 3.

BOLIVIA.

**MECODIUM PERAX** (van den Bosch) Copeland comb. nov.

*Hymenophyllum perax* VAN DEN BOSCH, Synopsis (1859) 52.

ECUADOR; VENEZUELA.

**MECODIUM MICROCARPUM** (Benth) Copeland comb. nov.

*Hymenophyllum microcarpum* DESVAUX, Prodr. (1827) 333

Tropical America.

**MECODIUM MACROTHECIUM** (Fée) Copeland comb. nov.

*Hymenophyllum macrothecium* FÉE, 11 Mém. (1806) 113, pl. 31 fig. 2

WEST INDIES.

**MECODIUM MYRIOCARPUM** (Hooker) Copeland comb. nov.

*Hymenophyllum myriocarpum* HOOKER, Sp. Fil. I (1844) 103, pl. 37D

From Bolivia to Mexico.

**MECODIUM AUDUBENI** (van den Bosch) Copeland comb. nov.

*Hymenophyllum audubeni* VAN DEN BOSCH, Synopsis (1859) 57

ECUADOR.

**MECODIUM NIGRICANS** (Peters) Copeland comb. nov.

*Spacerocidium nigricans* FRESL, Linnæa 18 (1846) 536.

Tropical America.

**MECODIUM CONTEXTUM** (Benth) Copeland comb. nov.

*Hymenophyllum contextum* ROSENSTOCK, Feddes's Rept. 22 (1926)  
3.

COSTA RICA.

**MECODIUM CONSTRICTUM** (Christ) Copeland comb. nov.

*Hymenophyllum constrictum* CHRIST, Bot. Boiss. II 4 (1904) 939

COSTA RICA.

**MECODIUM PROTRUSUM** (Hooker) Copeland comb. nov.

*Hymenophyllum protrusum* HOOKER, Sp. Fil. I (1844) 104, pl. 37E.

CENTRAL AMERICA; BOLIVIA.

**MECODIUM COSTARIANUM** (van den Bosch) Copeland comb. nov.

*Hymenophyllum costaricum* VAN DEN BOSCH, Ned. Kr. Arch. 53  
(1865) 161

From Costa Rica to Bolivia.

*MECODIUM SILIQMOSTUM* (Christ) Copeland comb. nov.

*Hymenophyllum siliqmosum* CHRIST, Bull. Bot. II 4 (1904) 232.

# COSTA RICA.

*MECODIUM CONTORTUM* (van den Bosch) Copeland comb. nov.

*Hymenophyllum contortum* VAN DEN BOSCH, Ned. Kr. Arch. 53 (1893) 170.

# From Costa Rica to Bolivia.

*MECODIUM RENIFORME* (Hooker) Copeland comb. nov.

*Hymenophyllum reniforme* HOOKER, Sp. Fil. I (1844) 110, pl. 38C

# PERU; ECUADOR.

*MECODIUM DENTRITIS* (Diet.) Copeland comb. nov.

*Hymenophyllum Dentritis* ROSENSTOCK, Fedde's Report. 6 (1909) 308.

# BOLIVIA.

*MECODIUM TABLAZIENSE* (Christ) Copeland comb. nov.

*Hymenophyllum tablaizense* CHRIST, Bull. Soc. Bot. Geneve II 1 (1909) 210.

# COSTA RICA.

*MECODIUM ALFREDII* (Fenzl) Copeland comb. nov.

*Hymenophyllum Alfredii* ROSENSTOCK, Fedde's Report. 22 (1925) 4.

# COSTA RICA.

*MECODIUM ABRUPTUM* (Hooker) Copeland comb. nov.

*Hymenophyllum abruptum* HOOKER, Sp. Fil. I (1844) 88, pl. 31B

# Tropical America.

*MECODIUM UNDULATUM* (Swartz) Copeland comb. nov.

*Trichomanes undulatum* SWARTZ, Prod. Fl. Ind. Occ. (1788) 137

# Tropical America.

*MECODIUM FENDLERIANUM* (Stuebel) Copeland comb. nov.

*Hymenophyllum fendlerianum* STUEBEL, Fl. Bras. I<sup>a</sup> (1859) 291.

# Tropical America.

*MECODIUM AXILLARE* (Swartz) Copeland comb. nov.

*Hymenophyllum axillare* SWARTZ, Schrad. Journ. (1801) 101.

# WEST INDIES; VENEZUELA.

*MECODIUM ASPLEIOMIDES* (Swartz) Copeland comb. nov.

*Trichomanes asplenoides* SWARTZ, Prod. Fl. Ind. Occ. (1788) 136.

# Tropical America.

*MECODIUM CAUDICIS LATUM* (Mart.) Copeland comb. nov.

*Hymenophyllum caudiculatum* MARTIUS, *l.c.* Cr. Bras. (1854) 162, pl. 57.

Patagonia to Brazil and Peru.

2. Genus *CRASPEDOPHYLLUM* (Presl) Copeland gen. nov.

*Hymenophyllum*, § *Craspedophyllum* Presl, *Hymen.* (1843) 125.<sup>2</sup>

*Pachyloma* VAN DEN BOSCH, *Eerste Bijdrage* (1861) 318, non De Candolle.

Frons simplex bilobaeque, glabra indusaeque marginata. Laciniae integrae. Sorus termin. is sessilis. Indusum l. partitum, integrum. Species novohollandica mihi ex unimodo ex iconis nota, verum ad ter genus proprium effluens.—PRESL, *loc. cit.*

Type, *C. marginatum* (Hooker & Greville) Copeland comb. nov.

*CRASPEDOPHYLLUM MARGINATUM* (Hooker & Greville) Copeland comb. nov.

*Hymenophyllum marginatum* HOOKER et Greville, *l.c.* F. l. (1823) p. 34; COPELAND, *Hymen.* (1937) 163, p. 87.

A monotypic genus, probably related to *Mecodium*, known from New South Wales and Tasmania; well characterized by the black contents of the obliquely placed marginal cells, internal walls wavy-thickened; involucre valvate to the base; receptacle cylindric, included.

3. Genus *HEMICYPATHEON* (Domin) Copeland gen. nov.

*Hymenophyllum* subgenus *Hemicypatheon* DOMIN, *Publ. Bot.* 20 Heft 55 (1913) 20.

Pinnulis (segmentis) ultimis integris vel spinuloso-denticulatis, indusis infundibuliformibus parte inferiore connatis sed supra profunde (usque ad medium vel ad partem tertiam bilabatis et campanulatis patentibus, receptaculo longo exsertis.—DOMIN, *loc. cit.*

Genus et *Mecodium* et *Meringia* subsumit, frondibus remotis, masculis tripinnatifidis, parietibus cellularum incrassatis, soris magnis pantotactis, involucris deorsum urceolatis sursum bivalvibus, receptaculo extruso.

Type, *H. Baileyanum* Domin, *loc. cit.*, sub *Hymenophyllum*.

A genus that I recognize as such because it consists of two species, certainly nearly related, of which one would be aberrant.

<sup>2</sup> As to this work, I cite the original pagination in *Abh. Bohm. Ges. Wiss.* V 3 (1843); to get the page numbers of the reprint, cited in Christensen's Index, subtract 22.

rant in *Mecodium* but wholly out of place in *Meringium*, the other aberrant in *Meringium* and wholly misplaced in *Mucidium*. They are alike in general aspect, which would not bar them from either large genus. The walls are less, and less regularly, thickened than in typical *Meringium*, so that the walls, and thus the texture, are intermediate, and would be unusual in either *Meringium* or *Mecodium*. The involucre is also intermediate, cleft as in *Meringium* but with less cuneate base, while unusual, there, it can be matched in *Mecodium*. The receptacle is meriagoid, but slender. I do not consider *Mecodium* and *Meringium* nearly related, but, far enough back, they did have a common ancestry. *Hemipatheon* may date back that far; or may share the characteristics of the two because of more recent hybridization; or the combination of apparent affinities may be fortuitous.

Range: New Caledonia and Queensland

#### SPECIES OF IDENTIFICATION

*HEMICYPATHEON DAILEYANUM* (Dowson) Copeland comb. nov.

*Hymenophyllum Daileyanum* DOWSON, Phil. Bot. 20 No. 85 (1913, 20, CORAID, Hymen. (1937) 78, pl. 36.

#### QUEENSLAND.

*HEMICYPATHEON DEPLANCHETI* (Hedl.) Copeland comb. nov.

*Hymenophyllum Deplancheti* MERTENIUS, L. n. 35 (1868) 392; CORAID, Hymen. (1937) 76, pl. 36.

#### NEW CALEDONIA.

#### 4. Genus SPHAEROCIONIUM Presl

*Sphaerocionium* PRESL, Hymen. (1843) 123.

*Dermatophylloium* PRESL, Epim. Bot. (1849, 258.

Costa teres, protuberans. Venae pinnatae, alternae, distantes, simplices ramosaeque. sacculus venulaeque conformibus apice libero desinentes. Sorus in lacina frondis terminalis, compresso-pinnatis, sessilis. Indusium b. l. m. lacina ovato-arbitulata obtusis adpressis, domum patentibus. Receptaculum indusio brevius, inferne cylindricum nudum, apice glabro-increasatum et capsuliferum. Capsulae lenticulares et aequae stipitatae. PRESL, loc. cit.

Epiphytica, rhizomate repente, radicibus praedito, frondibus remotis, majusculis, pinnatim dissectis, margine costaeque (rarius superficie) setis simplicibus vel saepius stellatis obsitis; chromatophoris minutis multis; acria pantotactis, involucre plerumque profundo fasso, receptaculo incluso.

Tropical America Florida to Chile, with a few scattered Old World species.



A large genus, distinguished from *Mecodium* by its pubescence, and from *Leptosium* by the included receptacle. There is closer apparent affinity to *Microtrichomanes*; if this be real, the latter may be regarded as a daughter genus.

Presl based his genus essentially on a single character, a receptacle with a comparatively slender sterile base, and a pilose sporangium-bearing head. On this basis he included naked species immediately related to several minor groups in *Mecodium*. The fact that it was thus evidently unnatural is probably responsible for the failure of his successors to recognize it at all. Characterized with emphasis on the pubescence, it is a natural genus, typified by *S. hirsutum*, which must be regarded as the type of Presl's genus. Correcting the long abuse of the term *Euhymenophyllum* and applying it properly to a group with toothed margin, Christensen, in the Third Supplement to the Index, has taken up *Sphaerocissium* as the subgeneric name for all species of *Hymenophyllum* with entire margin. As I construe it, it is the group segregated by Prantl<sup>2</sup> as "Sect. 4 Pilosa". In the Synopsis of van den Bosch this is the group of *Hymenophyllum* with "*Fronds vestita*," species 97-134.

The hairs in a majority of the species are restricted to the axes and margins. When they have long basal cells at the top of which they branch, they cover the surface with a dense felt, even though none originate there. Marginal hairs are regularly placed, as shown by Prantl. The cell from which one springs may or may not be differentiated evidently. Its differentiation may involve the adjacent cells, the hair then being borne on a projection of the margin, a tooth. In a few cases such teeth have been confused with those of *Meringium*, but they are not homologous. Even when the teeth of *Meringium* are prolonged into short hairs, these are rows of cells, and not bristlike, as are all the simple hairs of *Sphaerocissium*. Stellate hairs casually branch from the end of a stalk cell, but in a few species the stalk cell is wanting and they branch from the base. Throughout the genus the ultimate branches and the simple setae are alike in being non-septate (above the base or basal cell), and sharp and stiff. There is no sharp line between branched hairs, hairs stellate from the base, paired setae, and simple, solitary setae. In a few species they are mixed. Sometimes the hairs on the rachis are mostly branched, those on the margin mostly simple,

<sup>2</sup> Hymen. 55.

and on some species (as *S. vulcatum*) an occasional hair is forked or branched. A branched hair may have a single branch, having a septum, and usually being bent at the distal end of the stalk cell.

It should be possible to break so large a genus into natural groups, but I do not know these plants intimately enough to do this with any confidence to the genus as a whole. It is not evident that the character of the receptacle can be used in this way, although I include here species with slender receptacles. The involucre, typically clothed nearly to the base, but sometimes with an evident nerved base, seems likewise to lack significance. It is only in short lips and in long to involucre are found together, and branched hairs disappear, in a group of apparently related species, reduced and dichotomous rather than pinnate in architecture, that these characters become evidently diagnostic for a group. And then, because the verbal definition of *Sphaeroclonium* (in distinction to hairy plants of *Trichomanes*) would become very different otherwise I feel constrained to recognize a smaller, related genus, *Microtrichomanes*. Generic status (as *Apteropteris*) is given also to one single species hitherto called *Trichomanes*, and *Hymenophyllum Molingii* because it is isolated among all ferns by vegetative peculiarity, its hairs are those of *Sphaeroclonium*.

#### SPECIES OF SPHAEROCLONIUM

With secondary lamellae present on the axes (*Dermatophlebium*).

*SPHAEROCLONIUM SPICATUM* (Sw.) Presl.

Cuba to Bolivia and Brazil.

*SPHAEROCLONIUM TOMENTOSUM* (Hornem) Presl.

ANDES.

*SPHAEROCLONIUM PUMOSUM* (Hornem) Copeland comb. nov.

*Hymenophyllum plumosum* Kaulfuss, Enum. (1824) 267.

*Sphaeroclonium auriculatum* Presl.

BRAZIL; COSTA RICA.

*SPHAEROCLONIUM PYRAMIDATUM* (Desf.) Copeland comb. nov.

*Hymenophyllum pyramidatum* Desvaux, Prod. (1827) 332.

ANDES

*H. feungarugensis* Karsten, Colombia, belongs here. Without secondary lamellae.

With branched hairs on axes, margin, and surface.

**SPHAEROCIONUM HIRSUTUM** (Sw.) Presl.

The type of the genus; Cuzco and Mexico to Chile

**SPHAEROCIONUM RADDIANUM** (N. Muller) Copeland comb. nov.

*Hymenophyllum raddianum* K. MÜLLER, Bot. Zeit. 12 (1854) 725.

BRAZIL.

**SPHAEROCIONUM INTERRUPTUM** (Kuhn) Presl.

Tropical America.

**SPHAEROCIONUM LANATUM** (Fée) Copeland comb. nov.

*Hymenophyllum lanatum* FÉE, 11 Mém. (1866), t. 6, pl. 31, fig. 3.

WEST INDIES.

**SPHAEROCIONUM RUPEM** (Fée) Copeland comb. nov.

*Hymenophyllum rupeum* FÉE, Crypt. Vasc. Brazil 1 (1858) 108, pl. 50, fig. 4.

BRAZIL.

**SPHAEROCIONUM SPECTABILE** (Muhl.) Copeland comb. nov.

*Hymenophyllum spectabile* MÖTTENIUS ex Kuhn, Linnæa 35 (1868) 392.

BOLIVIA.

**SPHAEROCIONUM BUCHTIIENII** (Ros.) Copeland comb. nov.

*Hymenophyllum Buchtiienii* ROSENSTOCK, Fedde's Repert. 5 (1908) 229.

BOLIVIA.

**SPHAEROCIONUM HEMIPTERON** (Ros.) Copeland comb. nov.

*Hymenophyllum hemipteron* ROSENSTOCK, Fedde's Repert. 22 (1925) 4.

COSTA RICA.

**SPHAEROCIONUM PALMENSE** (Ros.) Copeland comb. nov.

*Hymenophyllum palmense* ROSENSTOCK, Fedde's Repert. 22 (1923) 5.

COSTA RICA.

**SPHAEROCIONUM WERCKLEI** (Christ) Copeland comb. nov.

*Hymenophyllum Wercklei* CHRIST, Bull. Boiss. 11 4 (1904) 940.

COSTA RICA.

**SPHAEROCIONUM HYGROMETRICUM** (Poech) Copeland comb. nov.

*Trichomanes hygrometricum* POECH, Enc. 2 (1808) 79.

*Sphaerocionium elatium* (Bory) FUKUN.

East African Islands.

**SPHAEROCIONUM SPLENDIDUM** (v. 4. B.) Copeland comb. nov.

*Hymenophyllum splendidum* VAN DEN BOSCH, Ned. Kr. Arch. 6<sup>e</sup> (1853) 192; COPELAND, Hymen. (1937) 174.

## WEST AFRICA.

Here seem to belong also:

With branched ... on axes and margin; surface naked.

*HYMENOPHYLLUM ALBIFRONS* (Pers.) C. C. C.

## TRISTAN D'ACUNIA

*HYMENOPHYLLUM LINDENI* Hooker.

## VENEZUELA; ECUADOR.

*SPHAEROCIONIDIUM CITRATUM* (Sw.) Presl

Tropical America to East African Islands.

*SPHAEROCIONIDIUM LINEARE* Sw. Presl.

## WEST INDIES

*SPHAERUM DAIKOTIKETUM* (C. Müller) Copeland comb. nov.*Hymenophyllum Crenatum* K. MÜLLER, Bot. Zeit. (1854) 722

West Indies to Brazil

*SPHAEROCIONIDIUM ANTILLENSE* Jenman Copeland comb. nov.*Hymenophyllum antillense* JENMAN Bul. Dept. Juss. No 18 (1890) 6.

## JAMAICA; HISPANIOLA

*SPHAEROCIONIDIUM ELEGANS* Spr. Copeland comb. nov.*Hymenophyllum elegans* SPR. Syst. Veg. IV (18.7) 133.

## BRAZIL; COSTA RICA.

*SPHAEROCIONIDIUM HORTICULUM* (Sw.) Presl

## WEST INDIES; MEXICO; CENTRAL AMERICA.

*SPHAEROCIONIDIUM DIVERGENTUM* Presl.

## HISPANIOLA.

*HYMENOPHYLLUM TRAPEZOIDALE* Lichen.

MEXICO This and the preceding species may be merely freaks.

*SPHAEROCIONIDIUM ELEGANTULUM* (C. C. C.) Copeland comb. nov.*Hymenophyllum elegantulum* VAN DEN BOSCH, Synopsis 69.*Hymenophyllum puchellum* HOOKER, Sp. Pl. I, pl. 331

Columbia to Bolivia.

*SPHAEROCIONIDIUM RUZIANUM* H.

## VENEZUELA; PERU

*SPHAEROCIONIDIUM TRICHOPHYLLUM* (C. C. C.) Copeland comb. nov.*Hymenophyllum trichophyllum* H. B. K., Nov. Gen. et Sp. I (1815) 97

## BRAZIL; ANDES.

**SPHAEROCIONIDIUM SANIPALLOANUM** (Brause et Ros.) Copeland comb. nov.

*Hymenophyllum Sanipalleanum* BRAUSE et ROSENSTOCK Bot. Mus. Rio de Janeiro 1 (1931) 136, pl. 1, fig. 2, pl. 3; *Hymenophyllum Sanipalleanum* in herb.

#### BRAZIL.

Here seem to belong:

**HYMENOPHYLLUM ADIANTOIDES** van den Bosch.

#### PERU.

**HYMENOPHYLLUM CRISPATELUM** van den Bosch.

#### PERU.

**HYMENOPHYLLUM SPRUCEI** Baker.

#### PERU.

**SPHAEROCIONIDIUM FERRUGINEUM** (Colla) Copeland comb. nov.

*Hymenophyllum ferrugineum* COLLA, Mem. Ac. Torino 39 (1886) 30.  
*Hymenophyllum submissimum* Kze.

Chile to New Zealand

**SPHAEROCIONIDIUM LANIERI LUTUM** (Hooker and Arnott) Copeland comb. nov.

*Hymenophyllum lanceolatum* HOOKER and ARNOTT, Bot. Beechey's Voy. (1832) 109.

#### HAWAII.

**SPHAEROCIONIDIUM OBTUSUM** (Hooker and Arnott) Copeland comb. nov.

*Hymenophyllum obtusum* HOOKER and ARNOTT, Bot. Beechey's Voy. (1832) 109.

#### HAWAII.

**SPHAEROCIONIDIUM ITALIUM** (Hooker) Copeland comb. nov.

*Hymenophyllum Lyallii* HOOKER f. Fl. N. Zealand II (1854) 16.  
*Trichomanes Lyallii* HOOKER, Syn. Fl. (1867) 77, COPELAND, Trich. (1933) 163 pl. 7, fig. 7; pl. 11, fig. 6.

NEW ZEALAND; NEW SOUTH WALES.

**SPHAEROCIONIDIUM FILICISSIMUM** (C. Chr.) Copeland comb. nov.

*Hymenophyllum filicissimum* C. CHR., Gardens Bull. S. S. ? (1924) 213.

BORNEO; PHILIPPINES, NEW GUINEA.

**SPHAEROCIONIDIUM MARLOTII** (Brause) Copeland comb. nov.

*Hymenophyllum Marlothii* BRAUSE, Fiedler's Report, 11 (1912) 122.

#### SOUTH AFRICA.

**SPHAEROCIONIDIUM CAPILLARE** (Desv.) Copeland comb. nov.

*Hymenophyllum capillare* DESVAUX, Prod. (1827) 333.  
*Sphaerocionidium pendulum* (Bory) Presl.

Africa and Islands.

**SPHAEROCIONUM FOOLII** (Baker) Copeland comb. nov.

*Hymenophyllum* from POOL BAKER, JOURNAL, Linn. Soc. 15 (1871) 413  
Icones PL 1760

MADAGASCAR.

With unbranched setae.

**SPHAEROCIONUM VILVATUM** (H. and G.) Copeland comb. nov.

*Hymenophyllum vilvatum* JOHNSON and GREVILLE, Icones VII, (1831)  
Pl. 29.

West Indies to Bolivia.

**SPHAEROCIONUM ELEGANTISSIMUM** (Fée) Copeland comb. nov.

*Hymenophyllum elegantissimum* FÉE, II Mem. (1866) 118, pl. 29,  
fig. 2.

WEST INDIES.

**SPHAEROCIONUM MEXICO ARCTUM** (Baker) Copeland comb. nov.

*Hymenophyllum mexicanum* DESVAUX, Prod. (1837) 39.

Tropical America.

**SPHAEROCIONUM DUNALDII** (Christ) Copeland comb. nov.

*Hymenophyllum Dunaldi*, CHRIST, Bul. Boiss. 4 (1896) 657.

COSTA RICA.

**SPHAEROCIONUM SUBRIGIDUM** (Christ) Copeland comb. nov.

*Hymenophyllum subrigidum* CHRIST, Bull. Boiss. II 3 (1906) 200.

COSTA RICA.

**SPHAEROCIONUM SEMIGLABRUM** (Des.) Copeland comb. nov.

*Hymenophyllum semiglabrum* ROSENSTOCK, Fedde's Report 9 (1910)  
67.

COSTA RICA.

Here seems to belong:

**HYMENOPHYLLUM PRASCAVILLAE** van der Boer.

WEST INDIES.

**SPHAEROCIONUM ELBERTIUM** (Des.) Copeland comb. nov.

*Hymenophyllum subobtusum* ROSENSTOCK, Fedde's Report 9 (1910-  
1911) 71; COMPLAN, Hymen. (1937) 173.

NEW CALEDONIA.

5. Genus **APTEROPTERIS** Copeland gen. nov.

*Hymenophyllum* subgen. *Apteropteris* COMPLAN, Hymen. (1937) 176.

Lamina vera omnino carente fragmentis brevibus cellularum axibus frons utraque excurrentibus plus stellatis dense adiectis substituta, segmentis frondis deinde crasse filiformibus raris appropinquatis. COPPELAND, loc. cit.

Species unica: *Apteropteris Malinget* (Hooker) Copeland

*APTROPTERIS MALINGET* (Hooker) Copeland comb. nov.

*Trichomanes Malinget* HOOKER, Gayden Ferns (1862) pl. 84.

*Hymenophyllum Malinget* J. STEIN, S. Hymen. 423 pl. 1 fig. 32;

GIESSENHAGEN, Flora (1890) 442, pl. 4, fig. 25, COPPELAND, Hymen. (1937) 176.

Epiphytic in New Zealand usually on *Libocedrus Bidwillii*. In Tasmania on *Athrotaxis selaginoides*. The illustrations of Mettenius and Giesse-Hagen show the structure perfectly. The best description is by Holloway,<sup>22</sup> who calls it 'certainly the most peculiar species of the New Zealand family both in its frond structure and in its distribution.'

The stellate hairs are unmistakable evidence of affinity to *Sphaerocionium*.

6. Genus *MICROTRICHOMANES* (Metténius) Copeland gen. nov.

*Trichomanes*, Gruppe *Micro-trichomanes* METTENIUS, Hymen. (1864) 413

*Corocormus*, § *Microtrichomanes* PRANTL, Hymen. 51.

Folia disticha . . . dichotome v. subpinnatifida . . . striis nullis

Folium non proliferum, margine saepe ciliatum induratus latitudinem limbi vix superans; pulvis rectus.—PRANTL, loc. cit.

Typice epiphytica, rhizomate filiformi late repente et intricato, radicibus praedito, frondibus parvis, repetiter dichotomis rarissime simplicibus, rachis vera ita carente, costis ubique alatis, margine at minute setiferis aut nudis, parietibus cellularum tenuibus; soris in apices segmentorum immersis, involucri obconico vel campanulato non bilabiato, receptaculo gracile modo exserto, sporangiis masculis.

Typus, *M. digitatum* (Swartz sub *Trichomanes*).

A small genus of the Old World Tropics, related to *Sphaerocionium* and probably derived from it.

Range: Malaya to Tahiti and Madagascar

Dealing with a group presumably derived, by reduction, from forms with more amply developed fronds, it must be observed, as in other such cases, that reduction is likely to result in convergent evolution, whereby species of diverse ancestry have be-

<sup>22</sup> Trans. N. Z. Inst. 54 (1928) 698, pls 66, 76

come similar. I may be misled in this manner into including in *Microtrichomanes* some species which do not belong here. So far as marginal setae are present, they present sufficient evidence of affinity to *Sphaerocionium*, and the gap between *S. Lyallii* and *M. palmatifidum* is too narrow to leave reasonable doubt on the subject. They would be treated as congenere, if the considerable number of species to which they are related in opposite directions did not make convenient an intergeneric boundary between them. As to the species without setae, they seem to be related to those which bear setae, but setae are structures not usually lost in the course of reduction of the fronds.

The relation of *Microtrichomanes* and the still more reduced genera, *Didymoglossum* and *Microgonium*, invites study. Between *Microtrichomanes* and *Gonocormus*, which are united by Prantl, there is no near affinity.

#### SPECIES OF MICROTRICHOMANES

**MICROTRICHOMANES PALMATIFIDUM** (N. Muhl.) Copeland comb. nov.

*Trichomanes palmatifidum* K. MÜLLER, Bot. Zeit. 12 (1854), 732; VAN DEN BOSCH, Hymen. Javan. 22, pl. 14; COPELAND, Trich. (1933) 162, pl. 7, fig. 6; pl. 11, fig. 1.

JAVA, SUMATRA; BORNEO; MALAY PENINSULA

**MICROTRICHOMANES RUDLEYI** Copeland

*Trichomanes Rudleyi* COPELAND, Trich. (1933) 162, pl. 11, figs. 2, 3

PAHANG

**MICROTRICHOMANES DIGITATUM** (Sw.) Copeland comb. nov.

*Trichomanes digitatum* SWARTZ, Syn. Fil. (1806), 370; COPELAND, Trich. (1933) 160, pl. 7, figs. 3, 4.

East African Islands, Malaya to Samoa? Christensen<sup>24</sup> would restrict this name to the form found in Madagascar and the Seychelles, recognizing *T. flabellatum* v. d. Bosch, described from Java, as distinct. Three Philippine forms might be distinguished, but probably blend. The following two species are still more aberrant.

**MICROTRICHOMANES DICHOTOMUM** (Kuhn) Copeland comb. nov.

*Trichomanes dichotomum* KUHN, Bot. Zeit. 6 (1848), 236; VAN DEN BOSCH, Hymen. Javan. 22, pl. 16; COPELAND, Trich. (1933) 160, pl. 7, fig. 5.

JAVA.

<sup>24</sup> Pterid. Madag., p. 3.



**MICROTICHOMANES TENIATUM** Copeland.

*Trichomanes tenuatum* COPLAND, Bishop Mus. Bull. 82 (1932) 6, pl. 2, Trich. (1933) 161, pl. 10.

**SOCIETY ISLANDS; SOLOMON ISLANDS****MICROTICHOMANES NETIPIUM** (v. L. B.) Copeland comb. nov.

*Trichomanes netipicum* VAN DEN BOSCH, Pl. Jungh. (1896) 54, Hymon. Javan. 21, pl. 15; COPLAND, Trich. (1933) 155, pl. 7, fig. 1.

JAVA, SUMATRA; CEYLON, TONKIN; NEW SOUTH WALES. This and the species to follow are without setae.

**MICROTICHOMANES PARVULUM** (Poir.) Copeland comb. nov.

*Trichomanes parvulum* POIRET, Lam., Fuc. 2 (1802) 64 not of most subsequent authors nor Cop. and Trich. (1933) 145.

*Trichomanes subthoroides* Bory, Copeland, Trich. (1933) 154, pl. 8.

*Hymenophyllum subthoroides* Mettenus, C. CHRISTENSEN, Pterid. Madag. 11, pl. 2, figs. 15-18.

East African Islands. The evidence suggested several times by Christensen and summarized in Pterid. Madag., p. 3, seems to leave little doubt that the original *T. parvulum* is the species later described by Bory as *T. subthoroides* removed to *Hymenophyllum* by Mettenus, and equally out of place there.

**MICROTICHOMANES FRANCOI** (Christ.) Copeland comb. nov.

*Trichomanes Francoi* CHRIST, Bull. Boissier 11 ? (1907) 648, Copeland, Trich. (1933) 156, p. 7, fig. 2.

**NEW CALEDONIA.****MICROTICHOMANES VITIENSE** (Baker) Copeland comb. nov.

*Trichomanes vitense* BAKER, Journ. Linn. Soc. Bot. 9 (1866) 328, pl. 8, fig. 2; DOMEX, Bibl. Bot. 20 10, pl. 3, fig. 3; Copeland, Trich. (1933) 157, pl. 9, figs. 1, 2.

FIJI; SAMOA; QUEENSLAND. The fronds are forked, or reduced to simple.

**7 Genus HYMENOPHYLLUM** Smith

*Hymenophyllum* SMITH, Mem. Acad. Turin 5 (1793) 418.

Sorus marginalis receptaculo cylindraceo insertus. Indusium bivalve sorum includens.—SMITH loc. cit.

Genus cosmopolitanum siveum terrestrium et epiphyticarum, rhizomate repente, frondibus mediocribus vel parvis pinnatum dissectis, marginibus serratis et s. id s. involucri profunde bivalvibus, receptaculo cylindrico interdum supra basin leviter incrassato, aut incluso aut involucri tantum longiore, sporangiiis magnis sessilibus.

Type, *H. tundrae* (L.) Smith.

A genus of perhaps 25 very similar species, notable for the occurrence in temperate lands, though not wanting in the Tropics. Its near affinity is to *Moringium* from which it is distinguished by the more deeply cleft involucre, the shorter receptacle, the absence of peculiarly (pitted) thickened cell walls, and usually smaller size. There are species in the far South, perhaps primitive, which share the characteristics of the two genera and there are very reduced species there and elsewhere when, in the course of reduction, have lost their clear generic criteria. However *Moringium* in its full development is so different that it seems clearly expedient to maintain both genera.

#### SPECIES OF HYMENOPHYLLUM

**HYMENOPHYLLUM TUNDRIGENSE** (L.) Smith.

Scotland to Italy; Atlantic Islands, South Africa, South America.

**HYMENOPHYLLUM CARINATUM** Baker.

Japan to India.

**HYMENOPHYLLUM SIMONSIANUM** Hooker.

India to Formosa.

**HYMENOPHYLLUM COMPOSITIFORME** Lab.

AUSTRALIA.

**HYMENOPHYLLUM GRACILESCENS** Dorn.

AUSTRALIA.

**HYMENOPHYLLUM REVOLUTUM** Colenso.

NEW ZEALAND.

**HYMENOPHYLLUM RUGOSUM** C. Chr. et Schubert.

JUAN FERNANDEZ.

**HYMENOPHYLLUM FALKLANDICUM** Hooker.

ANTARCTIC AMERICA.

**HYMENOPHYLLUM FELTATUM** Dorn.

All southern lands, to Norway.

**HYMENOPHYLLUM ANTARCTICUM** Presl.

AUSTRALIA.

**HYMENOPHYLLUM AFFINE** Hooker.

FIJI.

HYMENOPHYLLUM PRUPISTUM Copeland.

BORNEO.

HYMENOPHYLLUM ASPERUM Kunze

ANDES.

HYMENOPHYLLUM MERINGHII Ros.

BOLIVIA.

Dwarfs which may be reduced representatives of either *Hymenophyllum* or *Merigium* are *H. pumilum* Moore, *H. Pumilio* Ros., and *H. minimum* Rich.

*H. Lovingeri* Clarke, of the Himalayas, described as bearing both hairs and peltate, is otherwise in this genus, but is not to be placed with confidence until so remarkable a peculiarity is verified.

*H. pectinatum* Cav., Antarctic America, belongs in this rather than in any other genus, but is an isolated species, like so many others of the far South.

### 8. Genus MERINGHII M Presl

*Merigium* Presl, *Hymen.* (1843) 116, pl. 86.

Type epiphyllaeae, frondibus remotis mediocribus, junctum decompositis, marginibus serrulatis vel rarius integris, parietibus cellularum saepe valde incrassatis et grosse villatis, soris paractatis, involucri deorsum obconicis sursum bivalvibus, receptaculo procelongo gracile, sporangia sessilibus magna.

Type, *Merigium meyenianum* Presl.

A genus of 60 or more recognized species, of the Tropics and South Temperate Zone, best developed in the Malay region, with several American species, and but one known in Africa, distinguished from *Hymenophyllum* by the closed lower part of the involucre and the long-exserted receptacle; also, in general, by larger and coarser fronds, with thick and coarsely pitted venas—like those of *Solenodesmium*. From India to Polynesia it is a common and homogeneous group. The New Zealand species are less distinct from *Hymenophyllum* in the development of the veins.

Presl overlooked the affinity to *Hymenophyllum*, compared his type with *Didymoglossum* and with the group of *Trichomanes* *virgatum*, and described and pictured the sori as "basi bracteatis." As nobody has since seen the bracts, his plant was long unrecognized and supposed to be some *Trichomanes* while the group it typifies came to be known by the name of another of his genera, really distinct, *Leptocionium*. He also gave generic

names, *Myrmecostylum* and *Ptychophyllum* to two other South Chilean plants, certainly related to *Moringum*, which I include in the latter. I believe, though, that since migration from a common home farther south the evolution of the American and Oriental groups has been independent.

There is a group of leafy species ranging from Madagascar to the Philippines, which, with some loss of stature have more or less completely lost the marginal teeth. *M. microglossum* and *M. pachydermum* seem always to be entire. *M. edentatum* is almost so. *M. holochitum* is serrulate, with sparse teeth. Although these entire species have been assigned to most diverse groups—several of them even to *Trichomanes*—there is no question whatever as to their affinity. They constitute a complete diagnosis of *Mezium*, but it is impracticable to separate them from it.

#### SPECIES OF MERINGUM

##### *MERINGUM MEYENIANUM* Pres.

*Hymenophyllum meyenianum* CORRENT. Hymen. (1937) 22, pl. 8.

PHILIPPINES; NEW GUINEA.

##### *MERINGUM BAKERI* Copeland.

*Hymenophyllum Bakeri* CORRENT. SARKIS. Mus. Journ. 2 (1917) 200; Hymen. (1937) 29.

Southern Philippines to Sumatra.

##### *MERINGUM KLATATENSE* (Christ) Copeland comb. nov.

*Hymenophyllum klatatense* CHRIST, Verh. Nat. Ges. Basel 11 (1904) 4. CORRENT. Hymen. (1937) 30.

CELEBES; MINDANAO.

##### *MERINGUM VITTATUM* Copeland.

*Hymenophyllum vittatum* CORRENT. Hymen. (1937) 31, pl. 9, figs. 1-3.

LUZON.

##### *MERINGUM RICHMANI* Copeland.

*Hymenophyllum richmanii* CORRENT. Hymen. (1937) 31, pl. 10.

LUZON.

##### *MERINGUM CAMPANULATUM* (Christ) Copeland comb. nov.

*Hymenophyllum campanulatum* CHRIST, Phil. Journ. Sci. S. C. 2 (1907) 155; CORRENT. Hymen. (1937) 32, pl. 11.

NEBROS (Philippines).

**MERINGIUM BONTOCENSE** Copeland.

*Hymenophyllum bontocense* COPELAND, Hymen. (1937) 33, pl. 12.

LUZON.

**MERINGIUM MERRILLI** (Christ) Copeland comb. nov.

*Hymenophyllum Merrilli* CHRIST, Phil. Journ. Sci. 1 C 2 (1907) 154; COPELAND, Hymen. (1937) 37, pl. 13.

LUZON.

**MERINGIUM RAMOSI** Copeland.

*Hymenophyllum Ramosi* COPELAND, Hymen. (1937) 34, pl. 9 figs. 4-6.

MINDANAO.

**MERINGIUM HOLOCHILUM** (v. A. R.) Copeland comb. nov.

*Leptocarpum holochilum* VAN DEN BOSCH, Fl. Jongh. 1 (1856) 501.  
*Hymenophyllum holochilum* C. Chr., COPELAND, Hymen. (1937) 34, pl. 14.

Java to Papuan and Malay Peninsula.

Apparent relatives of *M. holochilum* are *Hymenophyllum rufifolium* v. A. v. Rosenburg, *H. rufifrons* v. A. v. R., *H. Elberti* Rosenstock, *H. brevifrons* v. A. v. R., *H. torricellianum* v. A. v. R., *H. elliptico-ovatum* v. A. v. R., *H. nutantifolium* v. A. v. R., *H. pectolatus folium* Cerasi, and *H. cuneolatum* Gepp.

**MERINGIUM IDENTULUM** (v. A. R.) Copeland comb. nov.

*Leptocarpum identulum* VAN DEN BOSCH, Ned. Kr. Arch. 53 (1863) 148.

*Hymenophyllum identulum* C. Christ, COPELAND, Hymen. (1937) 24, pl. 7.

ASSAM, LUZON; BORNEO.

**MERINGIUM PACHYDERMICUM** (Cerasi) Copeland comb. nov.

*Hymenophyllum pachydermicum* CERASI Atti. Accad. Napoli 2 (1876) 8; COPELAND, Hymen. (1937) 20, pl. 5.

Philippines to Sumatra.

**MERINGIUM PINANGIANUM** (C. and C.) Copeland comb. nov.

*Hymenophyllum pinangianum* MATTHEW and CHRIST, Journ. Linn. Soc. Bot. 39 (1909) 214; COPELAND, Hymen. (1937) 19, pl. 4.

BORNEO; MALAY PENINSULA.

**MERINGIUM MACROGLOSSUM** (v. A. R.) Copeland comb. nov.

*Hymenophyllum macroglossum* VAN DEN BOSCH, Ned. Kr. Arch. 53 (1863) 156; COPELAND, Hymen. (1937) 19, pl. 3.

CEYLON.

**ADLANTUM TENELLUM** (Desq.) Copeland comb. nov.

*Adiantum tenellum* JACK. Cat. Bot. III (1789) 257, pl. 21, fig. 3

*Hymenophyllum viciifolium* Bory. CORRELAND, Hymen. (1937) 17, pl. 1

#### East African Islands.

**MERINGIUM POTLENIANUM** (Rox.) Copeland comb. nov.

*Hymenophyllum potleianum* ROSENSTOCK, Meded. Rijks Herb. Leyden No. 11 (1913) 1; CORRELAND, Hymen. (1937) 18, pl. 2

#### MADAGASCAR.

**MERINGIUM PULCHRUM** Copeland.

*Hymenophyllum pulchrum* CORRELAND, Hymen. (1937) 22, pl. 6

#### Southern Philippines.

Apparently in the same group as the preceding seven species, with margins entire or nearly so, are *H. batanense* Ros., Batan Island, and *H. Hulleri* Ros., Borneo

**MERINGIUM BRACHYGLOSSUM** (A. DC.) Copeland comb. nov.

*Hymenophyllum brachyglossum* A. DC., Bot. Zeit. 3 (1845) 227; CORRELAND, Hymen. (1937) 40.

#### JAVA.

**MERINGIUM DENTICULATUM** (Sw.) Copeland comb. nov.

*Hymenophyllum denticulatum* SWARTZ, Schrad. Journ. (1801) 100, Synopsis (1806) 148, 373, CORRELAND, Hymen. (1937) 41, pl. 15.

#### Ceylon to Fiji.

**MERINGIUM HOSER** Copeland.

*Hymenophyllum Hoseri* CORRELAND, Philip. Journ. Sc. & C. 12 (1917) 46; Hymen. (1937) 43, pl. 16

#### BORNEO.

This transfer precludes that of the same specific name for the earlier *Trichomanes Hoseri* which is *Meringium penangianum*; the purpose being to avoid a new specific name for *H. Hoseri*.

**MERINGIUM ACANTHOIDES** (L. DC.) Copeland comb. nov.

*Didymoglossum acanthoides* VAN DEN BOSCH, Pl. Java II (1845) 16  
*Hymenophyllum acanthoides* ROSENSTOCK, CORRELAND, Hymen. (1937) 45, pl. 17

#### Java to Luzon; FORMOSA; NEW GUINEA.

**MERINGIUM CARDUNCULUS** (C. Chr.) Copeland comb. nov.

*Hymenophyllum Cardunculus* C. CHRISTENSEN, Mitt. Inst. Bot. Hamburg 7 (1928) 144; CORRELAND, Hymen. (1937) 47

#### BORNEO.

**MERINGIUM KERIANUM** (Watts) Copeland comb. nov.

*Hymenophyllum kerianum* WATTS, Proc. Linn. Soc. N. S. Wales 39 (1915) 767; COPELAND, Hymen. (1937) 48.

#### QUEENSLAND.

**MERINGIUM MACROSPORIUM** (V. A. V. E.) Copeland comb. nov.

*Hymenophyllum macrosporium* V. A. V. ROSENTHAL, Bull. Jard. Bot. Bur. 16 (1914) 18; COPELAND, Hymen. (1937) 48.

#### SUMATRA.

**MERINGIUM LOBBII** (Moore) Copeland comb. nov.

*Hymenophyllum lobbi* MOORE n. van den Bosch, Ned. Kr. Arch. 5\* (1833) 176; COPELAND, Hymen. (1937) 49.

#### BORNEO.

**MERINGIUM BLANDUM** (Racib.) Copeland comb. nov.

*Hymenophyllum blandum* RACIBORSKI, Prerid. Bur. (1893) 29; COPELAND, Hymen. (1937) 50, pl. 13.

#### JAVA to LAOS.

**MERINGIUM REDUCTUM** Copeland.

*Hymenophyllum reductum* COPELAND, Hymen. (1937) 53, pl. 20.

#### PHILIPPINES

**MERINGIUM ROSENSTOCKII** (Brause) Copeland comb. nov.

*Hymenophyllum Rosenstockii* BRAUSE, Bot. Jahrb. 56 (1920) 43; COPELAND, Hymen. (1937) 53, pl. 21 figs. 1-2.

#### NEW GUINEA.

*Hymenophyllum Herterianum* Brause may belong here; I have not seen the sorus.

**MERINGIUM DIMIDATUM** (Steud.) Copeland comb. nov.

*Hymenophyllum dimidatum* WENTENES, Linnaea 35 (1868) 393; COPELAND, Hymen. (1937) 51.

#### NEW CALIFORNIA

**MERINGIUM OVATUM** Copeland.

*Hymenophyllum ovatum* COPELAND, Phil. Journ. Sc. 8 C 5 (1911) 70; Hymen. (1937) 50, pl. 22.

#### PAPUA.

**MERINGIUM RUBELLUM** (Rac.) Copeland comb. nov.

*Hymenophyllum rubellum* ROSENSTOCK, Nova Guinea 2 (1912) 716; COPELAND, Hymen. (1937) 56.

#### NEW GUINEA.

**MERINGERIUM FIRMUM** (F. A. C. S.) Copeland comb. nov.

*Hymenophyllum firmum* F. A. C. ROBERTSON, Nova Guinea 14 (1924)  
28, COPELAND, Hymen. (1937) 57.

#### NEW GUINEA.

**MERINGERIUM (DOLANECUM) Copeland.**

*Hymenophyllum dolanecum* COPELAND, Hymen. (1937) 60, pl. 26

#### SOLOMON ISLANDS.

**MERINGERIUM MACGILLIVRAYI** (Baker) Copeland comb. nov.

*Trichomanes Macgillivrayi* BAKER, Ann. Bot. 5 (1891) 195

*Hymenophyllum Macgillivrayi* COPELAND, Hymen. (1937) 60, pl. 25.

#### FIJI

**MERINGERIUM FRIESENII** (Metc.) Copeland comb. nov.

*Hymenophyllum friesenii* BRACKENRIDGE, U. S. Expl. Exped. 16  
(1854) 260, pl. 37, COPELAND, Hymen. (1937) 61, pl. 27

#### FIJI

**MERINGERIUM PRACTICISUM** (Christ) Copeland comb. nov.

*Hymenophyllum practicum* CHRIST, Bot. Jahrb. 23 (1896) 338;  
COPELAND, Hymen. (1937) 62, pl. 28.

#### SAMOA.

*Hymenophyllum minimum* Richard, *H. punctatum* Moore, and  
*H. pusillo* Ros., are exceedingly reduced species, which may be-  
long here.

**MERINGERIUM MULTIFIDUM** (Forster) Copeland comb. nov.

*Trichomanes multifidum* FORSTER, Prodr. (1786) 85.

*Hymenophyllum multifidum* SWARTZ, COPELAND, Hymen. (1937) 65, p.  
30, figs. 1-3.

#### NEW ZEALAND.

**MERINGERIUM BIVALEVE** (Forster) Copeland comb. nov.

*Trichomanes bivaletae* FORSTER, Prodr. (1786) 85.

*Hymenophyllum bivaletae* SWARTZ, COPELAND, Hymen. (1937) 66, pl. 30,  
figs. 4-6.

New Zealand to Queensland.

The preceding two species have the form and aspect of *Merin-  
gium*, and are therefore included in it; but the structure is  
rather that of *Hymenophyllum*. They may represent an evolu-  
tionary stage prior to the typical differentiation of the two  
genera.

**MERINGERIUM TRIANGULARE** (Baker) Copeland comb. nov.

*Hymenophyllum triangulare* BAKER, Syn. Fil. (1873) 69; COPELAND,  
Hymen. (1937) 67.

#### AFRICA.



*MERINGIUM TORTUOSUM* (H. and G.) Copeland comb. nov.

*Hymenophyllum tortuosum* HOOKER and GREVILLE, *Icones Fl.* 1829) pl. 129.

*Myriophyllum tortuosum* PRESL, *Hymen.* 119, pl. 104.

#### ANTARCTIC AMERICA

*MERINGIUM Plicatum* (Presl.) Copeland comb. nov.

*Hymenophyllum plicatum* KALFUS, *Enum.* (1824) 268.

*Ptychophyllum plicatum* PRESL, *Hymen.* 120, pl. 112.

#### ANTARCTIC AMERICA

The two preceding species are the types of Presl's cited genera. To me they seem to be very typical *Meringium*, conforming in wall structure, margin, and involucre, and, so far as my poor fruiting material shows, in receptacle. The more or less overfull and therefore ruffled or crisped lamina of *M. plicatum* is no novelty in the genus. Presl described and figured one valve of the involucre as cleft to the base. I have seen such a monstrosity, very rarely, in Philippine species, and do not find it in the material in hand of *M. plicatum*.

*H. quadrifidum* Philippi is described as having a 4-valved involucre. If this is a fixed character not a remarkable abnormality the subject will best be regarded, as he suggested, as constituting a genus *Tetralasma*. I have now (May, 1938), by the kindness of Mr. Gaetano Looser, a photograph of part of the original collection of this plant, and am sure that the quadrifid involucre is not a constant peculiarity. The species appears to be *M. magellanicum*.

*MERINGIUM MAGELLANICUM* (Desf.) Copeland comb. nov.

*Didymoglossum magellanicum* DESVAUX, *Prod.* (1827) 331.

ANTARCTIC AMERICA, southern Brazil. Typical *Meringium*, throughout its range.

*MERINGIUM SECUNDUM* (H. and G.) Copeland comb. nov.

*Hymenophyllum secundum* HOOKER and GREVILLE, *Icones Fl.* (1829) Pl. 123.

ANTARCTIC AMERICA. The internal walls are somewhat reticulate-thickened.

*MERINGIUM FUCOIDES* (Sw.) Copeland comb. nov.

*Trichomanes fucoides* SWARTZ, *Prod. Fl. Ind. Occ.* (1788) 136.

Tropical America. Internal walls feebly reticulate-thickened.

*H. dentatum* Cav., southern Chile, has the margin and involucre of *Meringium*, but is otherwise too distinct for easy inclusion. Neither does it go naturally into any other genus. In

its sharing of the characteristics of the modern genera it impresses me as more generalized than *M. multiplex*, in that it seems related to *Mecodum*, which is not a general by any means as close to *Meringium* as is *Hymenophyllum*.

#### B. Genus AMPHIPTERUM Presl

*Amphipterum* Presl, Nym. Bot. (1852) 255.

Altior evolutionis gradus eas illic, si rufescentes vanaeque ala foliacea libera bilaterali serrata in pagina superior frondis instructae sunt. Talem organisationem exhibet inter Trichum, novae a *Amphipterum fuscum* (*Trichomanes fuscum* Blume, . . . —Presl, loc. cit.

Genus *Meringio* derivatum, ventis aut inferne potius utraque facie alia vel cristis accessoriis praeditis distinguendum, margine aut serrulato aut integra; soria magnis segmenta axillaria abbreviata tertiaria (vel aursum secundaria) terminantibus. Invenio via ad medium longitudinem bisulcato, deorsum cristato vel laminato, receptaculo valde exarso.

As in the case of some other genera for which I use Presl's names, he left them really *nomen nudum*, except as the citation of a species serves perfectly for their identification. In the case of *Amphipterum*, in contrast to *Mecodum*, what little he wrote to characterize it is approximately correct. The accessory wings are the sole distinction from *Meringium*. There are several species of *Sphaerocionium* with similar structures, and they probably constitute a natural group; I do not set this group up as a genus, because such a genus would shade into *Sphaerocionium* and its recognition would not facilitate the definition or recognition of the parent genus. *Amphipterum* is clear-cut, that is, there is no known species with incipient or occasional accessory wings. And its recognition facilitates that of *Meringium*, because two of its species have entire margins. It is true that species with entire margin remain in *Meringium*; these are not near relatives of *Amphipterum*, and cannot be set off generically because they intergrade in this respect with the parent.

Four species are known to me, ranging from Sumatra to Papua.

#### SPECIES OF AMPHIPTERUM

*AMPHIPTERUM FUSCUM* (Blume) Presl

*Trichomanes fuscum* BLUME.

*Hymenophyllum fuscum* VAN DEN BOSCH, Hymen. Javan. 62 pl. 51, 52; COEHLAND, Hymen. (193") 60, pl. 33.

JAVA; SUMATRA

**AMPHITERIUM LEDERMANNI** (Brause) Copeland comb. nov.

*Hymenophyllum Ledermannii* BRAUSE, Bot. Jahrb. 50 (1920) 41, Copeland, *Hymen.* (1937) 70, pl. 32.

**NEW GUINEA.** *H. cerium* Gepp may provide the correct specific name of this species.

**AMPHITERIUM CELLENSIS** (Reed) Copeland comb. nov.

*Hym. nophyllum gelseae* ROSENSTOCK, Feuille's Report. 5 (1908) 372, Copeland, *Hymen.* (1937) 72 pl. 33.

**NEW GUINEA.**

**AMPHITERIUM LAMINATUM** Copeland.

*Hymenophyllum laminatum* COPELAND, Philop. Journ. Sci. § C 6 (1911) 70, *Hymen.* (1937) 73, pl. 34.

**PAPUA.**

10. Genus **MYRIODON** Copeland gen. nov.

*Hymenophyllum* subgenus *Myriodon* COPELAND, *Hymen.* (1937) 73.

Lamina normale cont. nne omnino carente, dentibus longitudinalibus ad rhachin costasque ubique et irregulenter mixtis substituta, involucre medio fissa ubique dentitern receptaculo extenso. (Copeland, loc. cit.)

Type, *M. odontophyllum* Copeland.

A genus of a single known species derived from *Meringum* and more particularly related to *M. denticulatum*. The frond looks so like the exceedingly crisped one of *M. acanthoides* that Brause described this as a variety of that species. But less superficial examination shows that instead of a crisped lamina it has no continuous lamina whatever, no patches of green tissue containing a vein, being thus almost unique among ferns. Its assimilating tissue consists of aplobiate teeth as that of *Apteropteris*, consists of filaments.

Species of **MYRIODON**

**MYRIODON ODONTOPHYLLUM** Copeland.

*Hymenophyllum odontophyllum* COPELAND, *Hymen.* (1937) 73, pl. 35.

**NEW GUINEA.**

11. Genus **BUEZIA** (Morton) Copeland gen. nov.

*Hymenophyllum* subgenus *Buezia* MORTON, Bot. Gaz. 93 (1932) 339.

F.lix pendula, rhizomatibus longe repentibus, caupites et rhachis paleis parvis latibus basi et laus 2- vel 3-seriatis pinnis instructi, stachos primarie secundarieque flexuosissime laminae elongatae pennatae, pinnis tripinnatifidis; segmenta ultima serrata, sori in lobulis internis contracti abbreviatis dispositi, indusium bilobum margine undulatum, receptaculum subglobosum crassum.

Species typica: *Hymenophyllum varifolium* Morton.—MORTON, loc. cit.

Genus *Merigio* affine, als axium majorem in pascas associatis, margine serrato, serie paratactis involucri profunde bivalvibus, receptaculo breve crasso.

I follow Morton's suggestion and treat this as a genus, although it is not very distinct from *Merigium* as here, perhaps too broadly, construed. The same palealike structures occur on *Merigium plicatum*, are reported on *Hymenophyllum Levingii*, and completely replace the usua. lamina of *Myriodon*.

#### SPECIES OF *BUESIA*

*BUESIA MEXICANA* (Morton) Copeland comb. nov.

*Hymenophyllum mexicanum* MORTON, Bot. Gaz. 93 (1932) 336, fig. 1.

PERU.

*BUESIA SODIROI* (C. Christ) Copeland comb. nov. Plate 2

*Hymenophyllum Sodiroi* C. CHRIST, Index (1906) 328; *H. pendulum* (SODIRO non Bory.)

ECUADOR.

*Buesia Sodiroi* is a stouter and less finely dissected species with huge sori. I conclude from Morton's description of *H. mexicanum* that besides the palea in the natural position of fragments of the wing, they are found scattered (spars m., out on the frond given me by the National Herbarium they seem all to originate in the pinne of the lamina. This is true of most of them on *B. Sodiroi*, but a few are unmistakably inserted out of this plane, which is less startling because they are inserted in all planes on the axes of *Myriodon*. Having seen these structures on *B. Sodiroi*, I can interpret the description and figure of another species, not seen, and confidently call it:

*BUESIA JAMESONI* (Hooker) Copeland comb. nov.

*Hymenophyllum Jamesoni* Hooker Spec. Fl. 1 (1844-96, pt. 354

ECUADOR. Except that the fertile segments are not constricted below them, the sori are exactly those of *B. Sodiroi*.

#### 12. Genus *LEPTOCIONUM* Presl

*Leptocionium* PRESL, Hymen. (1843) 118, II D.

Venae planatae, simplices, prominulae, ibere desinentes. Sorus terminalis, sessilis. Indusium usque fere ad basim bipartitum suborbiculatum, laciniis planis appressis margine aequaliter serrato-ciliatis. Receptaculum cylindricum, obtusum, undique capsuliferum, junior indusio aequilongum, adultum duplo longius nudum c. atriculis oblongis spiralibus notatum. Capsulae lenticulares, sessiles.

Genus inter *Trichomanoides* et *Hymenophylloides* intermedium, priorum receptaculum posterorum indusium possidens.—PRESL, loc. cit.

A single species, *L. dicranotrichum* Presl, of southern Chile. (Plate 3)

Actually, the margin is entire, as Presl drew it. Margin and surface bear many very short setae, which are mostly geminate. *Leptocionium* has the sorus of *Meringium*, and the margin and setae of *Sphaerocionium*, the setae short and simple, commonly pinnate.

Not knowing or appreciating Presl's *Meringium*, which has page priority, van den Bosch adopted Presl's name *Leptocionium* for all Hymenophyllaceae with toothed margins, and the use of the name in this sense, as a subgenus, has been usual since his time, but is corrected in the third Supplement to Christensen's Index.

### 13. Genus SERPYLLOPSIS van den Bosch

*Serpyllopsis* VAN DEN BOSCH (Synopsis p. 37, nomen), Versl. Akad. Wetens. Amsterdam 11 (1881) 318.

Fronds pinnate, pinnae simplices integrae vena simplici percurrente, soristeriales, receptaculum incrassatum teres.—VAN DEN BOSCH, loc. cit.

Christensen amplified the generic description, emphasizing: "1) the indefinite growth of the leaves, and 2) the pubescence of thick red hairs along the rachis and midribs of pinnae beneath."<sup>22</sup>

The type species, and the only species named as in the genus, is *S. caespitosa* (Gaud.) C. Chr.<sup>23</sup> (Plate 4), *S. antarctica* v. d. Bosch.

Range. Antarctic America, Falkland Islands, Juan Fernandez. Christensen<sup>22</sup> recognized three varieties, besides the typical form. Of these, two have specific names in *Hymenophyllum*. *H. densifolium* Philippi, with deeply bilabiate involucre with obscurely dentate lips; and *H. Dusenii* Christ, the involucre with entire, truncate mouth, but with few and spatulate pinnae and evident, filiform stipe. The typical form has subsessile fronds and pinnae with broadly rounded bases and the involucre very shallowly bilabiate with dentate lips. Christensen and Skottsberg<sup>24</sup> described still another variety, *fernandeziana*, with deeply immersed and broadly winged involucre cleft halfway down, and dentate lips everted on the back.

<sup>22</sup> Ark. v. f. Bot. 10<sup>1</sup> (1910) 28.

<sup>23</sup> Archiv. f. Bot. 10<sup>2</sup> (1910) 29.

<sup>24</sup> Loc. cit.

<sup>25</sup> Pierid. of Juan Fernandez (1920) 5.

Aside from the fructification, there is a strong but perhaps superficial resemblance to *Hymenophyllum raron*, and the far southern occurrence of both makes their affinity a reasonable conjecture. Even if this were established, it would remain expedient to maintain *Scopolopsis* as a genus, whether with one or with three or more known species.

#### 11. Genus HYMENOGLOSSUM Presl

*Hymenoglossum* Presl, Hymenophyllaceae (1843) 105

Costa utrinque teres, prostrata flexuosa. Venae oppositae, suboppositae alternatae, angulo medio ciliolatas, parallelae, utrinque prostratae, simplicissimae, in dentibus frondis in venis ciliolatis, ante marginem obtuse desinentes. Sorus in dentibus frondis apicales.

Rhizoma repens, filiforme. Frondes glaberrime.

Species. *Hymenoglossum erementum* (*Hymenophyllum erementum* Cav.)

—Presl, loc. cit.

Range. Chile, Juan Fernandez.

The genus was returned by van den Bosch<sup>18</sup> and by Christensen and Skottsborg<sup>19</sup> was unknown to Prantl, and is included in *Hymenophyllum* by other authors, including Christensen in that genus it is isolated by characters of form and structure. As to form, the fronds are simple and large, about 10 cm long and broadly lanceolate, no other species in the family resembles it. The venation is simple, remote, parallel. The margin varies from slightly (sterile) to obtusely serrate, with a sinus at the end of each tooth half immersed and cleft halfway down, the tips entire, receptacle included. Anatomical characters are a broad marginal band two cells thick and a thickened line around each parenchyma cell next to the outside wall.<sup>20</sup> (Plate 5.)

There is no evident particular affinity to any other species or group.

#### 12. Genus CARDIOMANTIS Presl

*Cardiomantis* Presl, Hymen. (1843) 104

Costa nulla. Venae pedata-fimbriatae, ciliolae, furcatae, steriles ante marginem frondis apice obtuso desinentes. Sorus intramarginalis, reniformis. Indusium campanulatum, ore integro. Capsulae lent rugosae, receptaculo clavato obtuso demum exserto unguiculis affixae. Presl, loc. cit.

Terrestre, rhizomate valido, late repente; stipitibus remotis, erectis; fronde simplice, reniforme, majuscula, coriacea, striata.

<sup>18</sup> Synopsis 45, B jdruga.

<sup>19</sup> Pteridophyta of Juan Fernandez. Nat. Hist. Juan Fernandez 2 (1920)

<sup>20</sup> Mettonius, Hymen. (1864) pl. 2, fig. 33.

ca. IV cellularum composita, venis flabellato-dichotomis, nervis marginalibus, involucri cylindricis immersis, receptaculo exserto.

A single species (Plate 6), perhaps the most isolated in the family, or endemic in New Zealand.

(CARDIOMANES RES. FORME (Paster) Presl.

#### 16. Genus VANDENBOSCHIA Copeland gen. nov.

*Trichomanes auctoritate omnium, part. ex.*

*Trichomanes* § *Entrichomanes* Presl, VAN DEN BOSCH, PRANTL, partim.

Type epiphytic rhizome elongate scandente, frondibus remotis, pinnatim dissectis; parietibus cellularum tenuibus, ubique conformibus; foris pantolactis, involucri infundibuliformibus ore non belabatis, receptaculis gracilibus protrasis, sporangia parvis. Species typica: *V. radicans* (Swartz. sub *Trichomanes*).

Range. That of the family.

This is the most nearly cosmopolitan genus in the family. Among those which have been included in *Trichomanes*, it is the least differentiated, on this ground I regard it as most nearly primitive. A considerable number of the genera of more limited geographic range are evidently derived from it. Thus *Cephaomanes* in the Orient can be derived approximately from the Oriental *V. australis*; while *Trichomanes*, in American genus, is traced back approximately through the American *T. rupestre* to *Vandenboschia*; the two lines of distinct origin being superficially so parallel in evolution that Prantl combined parts of them in one small genus, *Lacostea*. Other probable derivatives of *Vandenboschia* are the pantropic *Stenodermum* (prior to dispersal from the Antarctic) the American *Davallopsis* and *Dudloglossum*, and the Oriental *Crepidopteris*, *Crepidomanes*, *Callistopteris*, *Nesopteris*, and *Pleuromanis*.

The failure of this very well-known group to bear any distinctive and valid name is explained under *Trichomanes* as due to the misapplication of that name to this group.

#### SPECIES OF VANDENBOSCHIA

VANDENBOSCHIA PHILIPPINA Nouvel Copeland comb. nov.

*Trichomanes Philippinum* Steud. Enum. Pl. r. var. Chl (1859) 28; VAN DEN BOSCH, Gedd. in, Meded. Rijk's Herb. Leyden No. 17 (1913) 24, fig. 13, COMSTANTIN and STORCKWAG, Florid. Juan Fernandez (1920) 2, fig. 1.

JUAN FERNANDEZ.

This is the most generalized species of the old genus *Trichomanes*. The fronds are either remote or clustered, and our limited material indicates the absence of sharp distinction between rhizome and stipe. This strongly suggests *Cinnamomum*, to which van den Bosch, as far as I can see, did not refer it. (His number, 82,<sup>20</sup> places it with *T. dichotomum*, a *Microtrichomanes*.) The involucre is variable in form, but sufficiently like that of *V. pyxidifera*. The very large cells suggest *Macroglena*. The stipellate walls of the marginal cells, and sometimes the submarginal, are altogether peculiar. This species may constitute a genus; but I prefer to let the most generalized member of the group stand at the bottom of the least specialized and in that sense most primitive, genus.

**VANDENBOSCHIA INGLE** (Christ) Copeland comb. nov.

*Trichomanes Ingle* C. Christ. Christensen and Skottsberg, *Pterid. Juan Fernandez*, 1920) 3, fig. 2.

**JUAN FERNANDEZ.**

Here probably belongs *T. pyxidiferum* var. *marchionium* E. Brown.

**VANDENBOSCHIA COLENSOI** (Hooker) Copeland comb. nov.

*Trichomanes Colensoi* Hooker, f. *Icones Pl.* 10 (1854) 979; Holloway *Trans. N. Z. Inst.* 84 (1923) pl. 73. Copeland, *Trich.* (1933) 137, pl. 3.

**NEW ZEALAND.**

**VANDENBOSCHIA FALLAX** (Christ) Copeland comb. nov.

*Trichomanes fallax* Christ, *Ann. Mus. Congo* V 3 (1909) 21, Christensen, *Dansk Bot. Arkiv* 7 (1932) 6, pl. 1, figs. 1, 2.

**WEST AFRICA; MADAGASCAR.**

**VANDENBOSCHIA DRAYTONIANA** (Brack.) Copeland comb. nov.

*Trichomanes draytoniana* Brackenridge, *U. S. Expl. Exped.* 16 (1854, 252, p. 36, fig. 7, Copeland, *Trich.* (1933) 133, pl. 1, figs. 4-7.

**HAWAII**

*Trichomanes Wildii* Bailey seems to belong here.

**VANDENBOSCHIA STENOCHRON** (Christ) Copeland comb. nov.

*Trichomanes stenochron* Christ *Fedde's Report.* 5 (1898) 10; Copeland, *Trich.* (1933) 133, pl. 1, fig. 2.

**KOREA.**

<sup>20</sup> *Ned. Kr. Arch.* 5\* (1861) 141



**VANDENBOSCHIA PARVA** Copeland.*Trichomanes parvum* COPLAND, Trich. (1933) 134, pl. 1, fig. 2.**FORNOSA.****VANDENBOSCHIA SCHMIDTIANA** (Zetzkay) Copeland comb. nov.*Trichomanes Schmidtianum* ZENKER, Taschenr. Dissert. (1843) 34, pl. 1, figs. 1, 3, 5; COPLAND, Trich. (1933) 135, pl. 2, fig. 1.**INDIA.****VANDENBOSCHIA PYRIDIFERA** (Lam.) Copeland comb. nov.*Trichomanes pyridif. Lam.* LINNÆUS, Sp. Pl. (1753) 1098, SLOSSON, Bull. Torrey Bot. Club 42 (1915) 651.

American Tropics, tropical (?) and South Africa.

I cannot distinguish *T. brasiliense* Desv. from this species.

Several other related "species" are unknown to me.

**VANDENBOSCHIA HYMENOPHYLLOIDES** (L. & B.) Copeland comb. nov.*Trichomanes hymenophylloides* VAN DEN BOSCH, Ned. Kruid. Arch. 3 (1863) 209; SLOSSON, loc. cit.**Tropical America.***T. borbaticum* van den Bosch, of the East African Islands is, *teste* Christensen, very nearly this species.**VANDENBOSCHIA DIAPHANA** (H. B. K.) Copeland comb. nov.*Trichomanes diaphanum* H. B. K., Nov. Gen. et Sp. 1 (1825) 25.**Tropical South America****VANDENBOSCHIA HERZOGII** (Ros.) Copeland comb. nov.*Trichomanes Herzogii* ROSENSTOCK, Meded. Rijks Herb. Leyden No. 19 (1912) 5.**BOLIVIA.****VANDENBOSCHIA SERRATIFOLIA** (Ros.) Copeland comb. nov.*Trichomanes serratifolium* ROSENSTOCK, Meded. 46 (1908) 77.**BRAZIL.****VANDENBOSCHIA TENERA** (HBK.) Copeland comb. nov.*Trichomanes tenerum* STEUD., Syst. Vag. IV (1827) 120.**Mexico to Uruguay.****VANDENBOSCHIA CAPILLACEA** (Lam.) Copeland comb. nov.*Trichomanes capillaceum* LINNÆUS, Sp. Pl. (1753) 1099.**Tropical America.**This and the preceding species are Prantl's section *Leptomanes*. *T. angustatum* Carm., of Tristan d'Acunha unknown to me, may belong here, may be *Macroglens*, or may be neither.

*VANDENBOSCHIA EXSECTA* (Nees) Copeland comb. nov.

*Trichomanes exsectum* KUNZE, Anal. (1845) 17, pl. 29, fig. 2.

#### SOUTHERN CHILE, JUAN FERNANDEZ

Like so many far-southern species this is rather isolated in character. Both the lamina and the tube of the involucre are peculiarly marginate.

*VANDENBOSCHIA RADICANS* (Nees) Copeland comb. nov.

*Trichomanes radicans* SWARTZ, Schrad. Journ. (1801) 17, Synops. 143, CORNELAND, Trich. (1933) 212, pl. 35, figs. 1, 2.

Tropical America and West Africa, north to Kentucky, Britain, India, and Japan, wanting or nearly so in Alaska and in Polynesia. In my treatise on *Trichomanes* I have reduced to this many supposed Oriental species. Many described American species have been treated in the same way by others. *T. speciosum* Willd., of the Canaries, is a local form probably worthy of specific recognition.

*VANDENBOSCHIA STANSIS* (Linn.) Copeland comb. nov.

*Trichomanes stans* LAMOUR, Sp. Pl. (1753) 1094.

#### WEST INDIES.

*TRICHOMANES GIGANTIFLUM* Nees.

Bourbon; perhaps local here and in Madagascar, but the name has been given to specimens from Sumatra to Fiji.

*VANDENBOSCHIA APULLEA* (Christ) Copeland comb. nov.

*Trichomanes apuleioides* CHRIST, C. Chr. Index (1866) 635; HOLTUM, Journ. Mol. Br. Roy. An. Soc. 8 (1923) 14, pl. 4; CORNELAND, Trich. (1933) 219, pl. 38, figs. 5-6.

#### Sumatra to Fiji.

*VANDENBOSCHIA MAXIMA* (Blume) Copeland comb. nov.

*Trichomanes maximum* BLUME, Enum. (1828) 228, VAN DEN BOSCH, Hymen. Javan. 25, pl. 18; CORNELAND, Trich. (1933) 217, pl. 38, figs. 1-4.

#### Malaya to Tahiti

*VANDENBOSCHIA JOHNSONENSIS* (Bailey) Copeland comb. nov.

*Trichomanes johnsonense* BAILEY, Proc. Royal Soc. Queensland 1 (1884) 14, lithograms pl. 26.

#### QUEENSLAND; PHILIPPINES.

*VANDENBOSCHIA CAVALLEA* (Gaud.) Copeland comb. nov.

*Trichomanes cavalleoides* GAMBELINO, Prayrelet, Voy. Bot. (1820) 378; CORNELAND, Trich. (1933) 215, pl. 36.

#### HAWAII.

*VANDENHESCHIA CARTOTHECA* (Milde.) Copeland comb. nov.

*Trichomanes cartotheca* LILLERHANT, Fl. Haw. (1888) 530, CORNELAND, Trich. (1933) 216, pl. 35, figs. 3, 4, pl. 37.

HAWAII.

*VANDEN BOSCHIA AURICULATA* (Blume) Copeland comb. nov.

*Trichomanes auriculata* BLUME, Enum. (1828) 224; CORNELAND, Trich. (1933) 228.

*Cephalomanes auriculatum* VAN DEN BOSCH, Hymen. Javan. 34, pl. 25.

Malaya to Japan and Papua.

# 17. Genus *POLYPHELEBIUM* Copeland nom. nov.

*Polyphelebium* VAN DEN BOSCH, Versl. Akad. Wet. Amsterdam 11 (1861) 32, non *Phlebophyllum* Nees (1832)

Epiphyticum, rhizomate scandente intricato filiforme; frondibus remotis pendentibus, mediocribus, pinnatifidis vel pinnatis, pinnis plerisque linearibus, rariis lanceolatis pinnatifidisque, membranaceis, costis pinnatis ramosis venulis dichotomis; soris axillaribus, involucri elongato-urceolato, ore expanso, receptaculo gracile longissimo.

An isolated, monotypic genus, the only plant in the family with very thin leaves in which the veins branch freely in undivided segments of the frond. What affinity it has is presumably to the group of *V. pyxidifera*.

Range: New Zealand to Tasmania and Queensland.

## SPECIES OF *POLYPHELEBIUM*

*POLYPHELEBIUM VENOSUM* (E. Br.) Copeland comb. nov. Plate 5.

*Trichomanes venosum* E. BRONX, Prod. Fl. N. Holland (1810) 159; CORNELAND, Trich. (1933) 138.

# 18. Genus *PLEUROMANES* Presl

*Pleuromanes* PRESL, Epim. Bot. (1843) 258

*Leucomanes* PRESL, ibid.

*Craspedocoron* VAN DEN BOSCH, Synopsis (1859) 21, as section, Hymen. Javan. (1861) 32, as genus.

Type epiphytica, rhizomate filiforme late repentis et intricato, mollior pilosior stipitibus remotis gracillimis, frondibus pendentibus glaucis, majusculis, bi-tripinnatifidis, segmentis linearibus margine incrassato, strato sclerenchymatico costam circumdante dilatato, parte mediae segmenti ideo crassa et onosa, mollior pilosa, soris axillaribus, involucri urceolatis ore aut truncato aut subexpanso receptaculo filiforme valde protruso.

A small, well-marked genus, derived from *Vandenboschia latifrons*, a relative of *V. pyxidifera*. In my paper on *Trichomanes*

I treated *T. latifrons* as a member of the daughter group, but, as a matter of convenient verbal definition, it is necessary to leave it in the parent genus. As to the margin, cf. Copeland, Hymen. (1937) pl. 10, and Mettenius, pl. 1, fig. 23.

Range: Ceylon and Luzon to Tahiti. *V. latifrons* is found from the Himalayas to Formosa and Luzon.

#### SPECIES OF PLEUROMANES

##### PLEUROMANES ACUTUM Presl.

*Trichomanes acutum* PRESL., Hymen. 134. COPELAND, Trich. (1933) 140.

LUZON. The type species.

##### PLEUROMANES PALIDUM (Hornem) Presl.

*Trichomanes palidum* HORNEM, Hymen. 235, COPELAND, Trich. (1933) 141.

The range of the genus

#### 19. Genus GONOCORMUS van den Bosch

*Gonocormus* VAN DEN BOSCH, Hymen Javan. (1861) 7, *Revue Botanique* (1861) 227.

Rhizomate et stipite vix vel tantum, distinguendis, tenuibus, obscuris, rigidis, apice stipitis typice proferentia, frondibus minutis, venatione flabellata, margine necosa, parietibus non villosis involucribus immersis lobiformi-campanulatis ore conspicue dilatatis, receptaculis exsertis.

A well-defined genus of exceedingly well-defined species, ranging from Africa across Polynesia and to Japan.

The first publication of the generic name was not accompanied by a diagnosis, but it is authenticated by described species of which the first is *G. minutus* (*Trichomanes minutum* Bl.). A diagnosis was published in the same year. I have discussed this group in sufficient detail in my treatise on Trichomanes.<sup>21</sup> The Marquesan specimen, *Mumford and Adamson 301*, which<sup>22</sup> I regarded as *T. parvulum*, is *T. latilabiatum* E. Brown.<sup>23</sup> Christensen<sup>24</sup> believes that *T. parvulum* Poir. is really the plant since called *T.* (or *Hypolepophyllum*) *sinthorpii* Des., and suggests that the widespread species of *Gonocormus* would better be called *T.*

<sup>21</sup> 142 ff.

<sup>22</sup> This issue, p. 106.

<sup>23</sup> Bishop Mus. Bull. 29 (1931) 8, fig. 3.

<sup>24</sup> *Prodr. Madagascar* (1932) 2.

*sexiangoides* Presl. A older name is *T. minutum* Blume, from which I do not consider *T. sexiangoides* genetically distinct.

If species are to be distinguished in *Gonocormus*, they may be:

*G. minutum* (Blume) v. d. Bosch, using this name for what has been called *T. parvulum*; the range of the genus.

*G. diffusum* (Blume) v. d. Bosch.

*G. prolifer* (Blume) Prantl, exemplifying the genus in its most characteristic development.

*G. Tegsmanni* v. d. Bosch.

**CONVOLVULUS ALAGENSIS** (Christ) Copeland comb. nov.

*Trichomanes alagense* CHRIST Philip Journ. Sci. § C 3 (1908) 270;  
COPELAND, Trich. (1933) 162, pl. 8, figs. 4-7.

**PHILIPPINES** More distinct than are most of these species.

**CONVOLVULUS LAFILIAE** (E. Brown) Copeland comb. nov.

*Trichomanes lafiliae* E. BROWN Bishop M. E. Bull. No. 69 (1931)  
8, fig. 3.

**MARQUEZAS.**

**20. Genus CREPIDOPTERIS** Copeland nom. nov.

*Trichomanes* § *Crepidopteris* PRESL, Hymen. (1813) 15, non *Crepidopteris* Blume (1825).

*Crepidomanes* VAN DEN BOSCH, Hyman Javan. (1861) 16, non Presl.

Aut epiphyticae aut terrestres, rhizomate gracile late repente, frondibus remotis minusculis, typico bipinnatifidis, rach. alata, venulae spuris nullis, cellulis marginalibus 1- vel 2-seriatis valde elongatis parietibus varie incrassatis, cellulis aliis isodiametricis par etibus tenuibus; sori segmenta acropetalia infima occupantibus, involucri infundibuliformibus alatis ore patente, receptaculo profruso.

Typus: *C. humilis* (Forster sub *Trichomanes*)

A small, well-defined genus of the Malay-Polynesian region, regarded as a relative of the group of *Vandenboschia pycnolifera* for want of other evident affinity; probably not nearly related to *Crepidomanes* with which it has been confused. The longitudinal elongate marginal cells are a convenient diagnostic characteristic, but the genus is recognizable at sight by a combination of characters—small size, thinness, narrowly elliptic form, degree of dissection, position of sori—which are not individually diagnostic. If two rows of cells are elongate, the inner row may be double in thickness (two cells deep).

## SPECIES OF CREPIDOPTERIS

CREPIDOPTERIS WILLIS (Forster) Copeland comb. nov.

*Trechomanes lancea* Forster, Prodr. (1766) 1<sup>o</sup>, Copeland, Trich. (1933) 164, pl. 12.

Sumatra to Tahiti, not to New Zealand

CREPIDOPTERIS CRACILLATA Copeland.

*Trechomanes gracillima* Copeland, Trich. (1933) 168, pl. 13

## LUSON

CREPIDOPTERIS ENBACHIANA (Presl) Copeland comb. nov.

*Trechomanes cullicerianum* Presl, Epim. Bot. (1849-51) 10, pl. 54.  
Copeland, Trich. (1933) 168, pls. 14, 15.

New Zealand to Norfolk, Fiji, and Tahiti.

CREPIDOPTERIS WILSONII (Bosson) Copeland comb. nov.

*Trechomanes Wilsoni* ROSENSTORFF, Feuille's Report 5 (1906) 35;  
Copeland, Trich. (1933) 170, pl. 16.

## NEW GUINEA.

CREPIDOPTERIS VIKILANDII (v. d. B.) Copeland comb. nov.

*Trechomanes Pfeifferi* VAN DER BOSCH, Ann. Sc. Nat. IV 16 (1861),  
90; Copeland, Trich. (1933) 171, pl. 17.

## NEW CALEDONIA.

## 21. Genus CREPIDOMANES Presl

*Crepidomanes* PRESL, Epim. Bot. (1851) 258.*Teschneria* PRESL, *ibid.*; Copeland (as group), Trich. (1933) 173

Caules parenchymatis mucron, seriales, rotundato-hexagonales in teribus crassiusculis. Venae venulaeque astantes, simplicies, contra conformes. Venula infra angustius tenuis, continua. Reliqua ut in *Eutrichomanes*.—PRESL, *loc. cit.* (et ann. p. 17)

Epiphytica rarius terrestria, rhizomate stipiforme, de repente, piloso, radicibus saepe vel semper carentibus; frondibus medio-  
cibus pinnatis dissectis (vel reductis digitatis), axibus pleris-  
que alatis, segmentis angustis monophlebis, margine integro  
nudo, stris sclerenchymaticis aut intramarginalibus aut irre-  
gulariter dispersis nunquam carentibus; soris typice axillaribus  
(paratactis), involuero obconico, vel campanulato, vel infundi-  
buliforme, alato, ore bifido (rarius symmetrice evoluta), re-  
ceptaculo exserto.

An Old World genus of a dozen or more species ranging from  
the East African Islands to Japan and Polynesia. The stems

afford a convenient and sure diagnostic character, and the mouth of the involucre is bilabiate with the single exception of *C. Christii*. This combination of characters has been regarded as sufficient to establish affinity to *Didymoglossum*, with which this group was combined by van den Bosch. Prantl then restricted the application of the name *Didymoglossum* to this group, and renamed the real *Didymoglossum* as *Hemiphlebium*. Actually it is not *Didymoglossum*, but *Microgonium*, which has immediate affinity to *Crepidomanes*. Because *Microgonium* is evidently a group of reduced species, *Crepidomanes* is likely to have been the parent genus. I have thought<sup>22</sup> that *Crepidomanes* was 'presumably derived from the group of *T. psidiferum*,' but am now as ready to share van den Bosch's view that it represents a coordinate evolutionary line, with some ultimate affinity to *Didymoglossum*. I do not believe however, that the bilabiate mouth of the involucre betrays any real near affinity to *Hymenophyllum*.

The species are locally variable, and dwarfing is common. The series of dwarfs of various species converges with reduction, until the more extreme dwarfs of diverse origin tend to become indistinguishable. *T. Lenormandi* which I list under *Microgonium* is evidently a very reduced *Crepidomanes*.

#### SPECIES OF CREPIDOMANES

**CREPIDOMANES INTRAMARGINALE** (M. and G.) Copeland comb. nov.

*Trichomanes intramarginale* Hooker and Greville, *Copeland, Trich.* (1933) 189, pl. 23, figs. 1-3.

CEYLON; INDIA. The type species of the genus.

**CREPIDOMANES BIPUNCTATUM** (Presl) Copeland comb. nov.

*Trichomanes bipunctatum* Presl, *Bot. Berol.* 8 (1803) 69; *Copeland, Trich.* (1933) 177, pl. 18, figs. 1-2.

Madagascar to Tahiti, with a gap in Malaya.

**CREPIDOMANES BILABIATUM** (Nees and Blume) Copeland comb. nov.

*Trichomanes bilabiatum* NEES and BLUME, *Nova Acta* 14 (1823) 123, pl. 13, fig. 2; *Copeland, Trich.* (1933) 179, pl. 18, figs. 3, 6.

JAVA; SUMATRA.

**CREPIDOMANES RUPECOLUM** (Blume) Copeland comb. nov.

*Trichomanes rupeolum* BLUME, *Bull. Buitenzorg* (1895) 24; *Copeland, Trich.* (1933) 181, pl. 19, fig. 2.

JAVA.

<sup>22</sup> *Trich.* (1933) 174.

**CREPIDOMANES BREVINES** (Pres.) Copeland comb. nov.*D. dywanis aspera* Benth. pro Dorel Hyeron, (1842) 372.*Trichomanes brevines* BAKER, Syn. Pl. 84; COPLAND, Trich. (1933) 182 pl. 20.**PHILIPPINES; GUAM; BORNEO****CREPIDOMANES CHRISTII** Copeland.*Trichomanes christii* COPLAND, Philip Jour. Sci. 1 (1906) Suppl. 231; Trich. (1933) 185 pl. 21.**Philippines to Sumatra.****CREPIDOMANES VERNILOSUM** (Hance) Copeland comb. nov.*Trichomanes bipunctatum* var. *reticulatum* ROBINSON, H. J. Downer, 56 (1915) 256.*Trichomanes reticulatum* COPLAND, Trich. (1933) 186, pl. 22 figs. 1-2.**NEW GUINEA****CREPIDOMANES NYMANI** (Christ) Copeland comb. nov.*Trichomanes nymanii* Christ, SCHUM. and LAUR., Flora Suluac Nachtz. (1905) 36; COPLAND, Trich. (1933) 187 pl. 1, fig. 4.**NEW GUINEA.****CREPIDOMANES PERVENTULOSUM** (v. A. v. K.) Copeland comb. nov.*Trichomanes perventulosum* v. A. v. ROSENBERG, Philip. Jour. Sci. § C 11 (1916) 103, pl. 6, fig. 2; COPLAND, Trich. (1933) 188, pl. 19; pl. 20, fig. 3.**AMBOINA****CREPIDOMANES LATIMARGINATA** (Eaton) Copeland comb. nov.*Trichomanes latimarginata* EATON, Proc. Am. Acad. 4 (1859) 111.  
COPLAND, Trich. (1933) 189 pl. 24.**India to Formosa.****CREPIDOMANES MEGISTOSTOMUM** Copeland.*Trichomanes megistostomum* COPLAND, Trich. (1933) 191, pl. 23, figs. 4-6.**SIAM.****CREPIDOMANES LATHEALATUM** (v. d. B.) Copeland comb. nov.*Trichomanes lathealatum* VAN DEN BOSCH, Ned. Kruid. Arch. 5\* (1867) 136; COPLAND, Trich. (1933) 192, pls. 25-26.**INDIA.**

There may be a considerable number of additional species in the Indo-Sino-Japanese region. More than a dozen have been named. I have seen authentic material of half of them and comparing type collections only, would deem them distinct enough. Among most plants this would be a satisfactory test of specific



identity. In this particular group, however, the characteristics embodied in the descriptions are subject to such wide variation, that I prefer not to risk encumbering synonymy with new combinations of names until the examination of many collections may show that the several supposed species do not too freely overlap as they vary. The examination of very many collections has shown that a number of "species" described from the Philippines and Java, apparently distinct if the types only are compared, are forms of the fairly protean *C. brevipes* and *C. bilabiatum*.

## 22. Genus MICROGONIUM Presl

*Microgonium* PRESL, Hymen. (1843) 111, VAN DEN BOSCH, Hymen. Javan. 5.

*Hemaphysbium* § *Microgonium* PRANTL, Hymen. 43

Type epiphytica, rhizomate filiforme, intricato velutino radicibus saepe vel semper carentibus; frondibus remotis, minimis integris vel lobatis, margine nudo. venatione fiabellata vel pinnata, venulis spuris praeditis, venatione planis; soris epitactis marginalibus, involucre elongato, ore expanso vix bilabiato, receptaculo extruso.

Range: Old World Tropics, one species apparently American. Evidently derived, by reduction, from *Crepidomanes*.

### SPECIES OF MICROGONIUM (SUBMARGINAL STRAND PRESENT)

**MICROGONIUM BIMARGINATUM** van den Bosch.

*Microgonium bimarginatum* VAN DEN BOSCH, Hymen. Javan. (1861) 7.

*Trichomanes bimarginatum* VAN DEN BOSCH, (1861) COPELAND, Trich. (1933) 208, pl. 33, figs. 1-4.

Malaya to Ceylon and Samoa.

**MICROGONIUM MINDORENSE** (Christ) Copeland comb. nov.

*Trichomanes mindorense* CHRIST, Philip. Journ. Sci. § C 3 (1908) 270;

COPELAND, Trich. (1933) 209, pl. 34, figs. 1, 2

MINDORO.

**MICROGONIUM CHAMPEDONTURUM** Copeland.

*Trichomanes champedonturum* COPELAND, Philip. Journ. Sci. § C 7

(1912) 53; Trich. (1933) 208, pl. 33, figs. 5-7

LUZON.

**MICROGONIUM CUSPIDATUM** (Willd.) Presl.

*Microgonium cuspidatum* (Willd.) Presl, Hymen. 11., pl. 6A, the type of the genus.

*Trichomanes cuspidatum* WILLDENOW, Copeland, Trich. (1933) 210, pl. 32, figs. 8, 9.

East African Islands.

## MICROGONIUM CRISpum (Willd.) Presl.

*Trichomanes crispum* WILLDENSOW, Copeland, Trich. (1923) 219, pl. 34, figs. 3-6.

## AFRICA.

*Trichomanes leucomeris* v. d. Bosch, of the Comores and Madagascar, belongs here by the original description, and *T. rugosum* C. Chr. clearly does so by definition<sup>2</sup>. But Christensen suspects that they are one species. And *T. leucomeris* in its larger forms would better be regarded as a reduced *Crepidomanes*.

Related to these but without any marginal vein are *T. fulgens* C. Chr. and *T. Knuthi* Hooker, of the same region.

## MICROGONIUM HOOKERI Presl.

*Microgonium hookeri* PRESL. (1848)

*Trichomanes hookeri* PRESL., Hymen. 108, non *Hypophyllum hookeri* PRES., ibid. 115.

*Microgonium bestersoniae* PRESL. ibid. 112 nomen. 193, pl. 6B.

Cuba to Guiana. Submarginal strand absent.

## MICROGONIUM SUBULINATUM (K. Muller) van den Bosch.

*Microgonium subulatum* (K. Müller) VAN DEN BOSCH, Hymen. Javan. 6, pl. 2.

*Trichomanes subulatum* K. MULLER, Copeland, Trich. (1923) 198, pl. 28, figs. 1, 2.

Assam to Papua.

## MICROGONIUM KENZATENSE (Parish) Copeland et al., n. sp.

*Trichomanes kenzatense* PARISH in Hooker, Sumat. C. Chr. (1890) pl. 1; COPELAND, Trich. (1923) 198, pl. 28, figs. 3, 4.

*Microgonium kenzatense* VAN DEN BOSCH.

MOULMEIN (or Tenasserim)

The involucre is obconic, but the false veins leave little doubt that this is a *Microgonium*.

## MICROGONIUM MOTLEYI van den Bosch.

*Microgonium motleyi* VAN DEN BOSCH, Hymen. Javan. 5, pl. 1.

*Trichomanes motleyi* VAN DEN BOSCH, Copeland Trich. (1923) 201, pl. 30, figs. 1-4.

BORNEO: MALAY PENINSULA; further range doubtful.

<sup>2</sup> Sauerste, Notes Pterid. 12-13, pl. 10, Pter. i. Macg. 2 figs.

**MICROGONIUM BECCARIANUM** (Cesati) Copeland comb. nov.

*Trichomanes beccarianum* CESATI, Atti Accad. Napoli 7 pt. 8 (1876)  
8, pl. 1, fig. 2; COPELAND, Trich. (1933) 200, pl. 20.

Ceylon to Formosa and the Solomon Islands.

The key, p. 197, of my treatise on *Trichomanes* is in error as to this species but the latter is correctly distinguished from *T. cultratum* in the text.<sup>39</sup>

**MICROGONIUM CULTRATUM** (Baker) Copeland comb. nov.

*Trichomanes cultratum* BAKER, Journ. Bot. 17 (1879) 205; COPELAND,  
Trich. (1933) 202, pl. 30, figs. 5-7.

FIJI; QUEENSLAND.

**MICROGONIUM OMPHALODES** Vieillard.

*Microgonium omphalodes* VIEILLARD

*Trichomanes omphalodes* C. Chr., Copeland, Trich. (1933) 203, pl. 31  
figs. 1-6.

*Trichomanes peltatum* BAKER (non Poiret) Journ. Linn. Soc. 9 (1865)  
336, pl. 80; GIESSENHAGEN Hymen., figs. 14-26

Java to Tahiti

*Hymenophyllum parvifolium* Baker, Moulmein, was described by both Baker and Kuhn as having stipe, but no veins except the costa. It may be a very small *M. hexzantium*.

*Trichomanes Hildebrandti* Kuhn, from the Comores, apparently collected only once, and scantily, is superficially very like *M. omphalodes*; it is larger, and scantily, is superficially very like *M. omphalodes*; it is larger, but *M. omphalodes* is variable in size. I have specimens of *M. omphalodes* more than 25 mm in diameter although 10 mm is a commoner size. The known range being from Tahiti to Java, extension to the African islands would not be surprising. However, Giesenhagen<sup>40</sup> has found, aside minor differences, that the lamina of *T. Hildebrandti* a several cells thick, with the chlorophyll confined to the upper superficial layer. It is, of course, no *Trichomanes*, in my use of that name; but, without a specimen, I do not know whether or not it is a *Microgonium*.

In my treatises on *Trichomanes* and on *Hymenophyllum* I have had repeatedly to emphasize the fact that simplification in form, and eventually in structure, is a natural concomitant of reduction in size; and that, in the course of simplification, the characteristics which indicate affinity and ancestry may more

<sup>39</sup> Pages 202, 203.

<sup>40</sup> Hymen., 449-452, figs. 1-5.

or less completely disappear, with the result that reduced plants of diverse ancestry may be very much alike.

In *Didymoglossum* and *Microgonium* we are dealing with plants as reduced as we know in the family, and must recognize the fact that so far as the group of characters which have commonly served for specific diagnosis are concerned descendants of almost any larger plants of the old genus *Trichomanes*, reduced to this point, might be regarded as conspecific. *Trichomanes minusoides* has been construed broadly and variously enough to illustrate this fact. Recognizing the difficulty of detecting real affinity among such reduced plants, I intended first to combine them, as *Didymoglossum* and avoid lack of confidence in the utility of such a genus. In particular the Oriental species have looked like derivatives of *Crepidomanes* (*Tuschnetia*), which is confined to the Old World, and I have hesitated to regard a pantropic group as derived from one of limited range and, therefore, presumably younger.

Study of the available American material, representing the generally accepted species, has now shown that they have a common significant character, in the possession of marginal setae, which are wanting on all species of the Malay-Polynesian region. On the strength of this distinction, already emphasized by Prantl,<sup>1</sup> I now regard the Oriental group, without setae, as phenetically distinct, and related to *Crepidomanes*, which has much the same range. *Microgonium Hookeri* is the only species falling outside this geographic range, and I may be in error in including it; it may be a very aberrant member of *Didymoglossum*. However, the expanded, nonbilabiate involucre of *D. Petrarum* argues no doubt as to its affinity, any more than does the symmetrically expanded mouth of *Crepidomanes Christii*, in a genus otherwise characterized by somewhat bilabiate mouths.

### 23. Genus CALLISTOPTERIS Copeland gen. nov.

Epiphyticae, rhizomate valido adscendente, stipitibus caespitosis, teretibus, setosis; frondibus magnis, basi plus minus angustatis quadripinnatifidis segmentis linearibus tenuiter membranaceis, pinnatibus tenuibus, involucribus innumeris, obconicis, ore truncato vel subbilabato, receptaculo exserto.

Typus: *C. apifolia* (Presl sub *Trichomanes*).

<sup>1</sup> Hymen, 40

A small, well-marked group, the showiest in the family.  
Range: Malaya across Polynesia.

SPECIES OF CALLISTOPTERIS

CALLISTOPTERIS APIFOLIA (Presl) Copeland comb. nov.

*Trichomanes apifolium* Presl, Hymen., (1843) 108, 136, var. gen.  
Bosch, Hymen. Java 26, pl. 1. Copeland, Trich. (1933) 227 pl.  
42, fig. 1

Sumatra to Samoa.

CALLISTOPTERIS DAUERIANA (Kuhn) Copeland comb. nov.

*Trichomanes dauerianum* Endlicher, Prod. Fl. Norfolk (1833) 17,  
Copeland, Trich. (1933) 229 pl. 42, fig. 2.

NORFOLK, LORD HOWE ISLAND.

CALLISTOPTERIS POLYANTHA (Hooker) Copeland comb. nov.

*Hymenophyllum polyanthum* Hooker, N. Z. exalt. Oceanic Species (1835) 132.

*Trichomanes polyanthum* Hooker, Copeland, Trich. (1933) 230, pl. 42  
fig. 3.

*Trichomanes socerense* J. W. Moore, Bishop Mus. Bull. 102 (1933) 5.

SOCIETY ISLANDS.

CALLISTOPTERIS BALDWINI (Kuhn) Copeland comb. nov.

*Hymenophyllum Baldwinii* Kuhn, Bul. Torr Bot Club 6 (1879) 293.  
*Trichomanes Baldwinii* Copeland, Trich. (1933) 230, pl. 42, figs. 4-8

HAWAII.

24 Genus NESOPTERIS Copeland gen. nov.

Terrestres, rhizomate valido suberecto, stipitibus caespitosus, longis, sursum anguste alatis ala decidua; frondibus magnis quadrilobis, nativis, basi vix angustatis, segmentis linearibus, costis pilis minutis clavatis obsitis; cellulis parvis, parietibus tenuibus rectis, involucri cylindricis alatis, receptaculis exsertis.

Typus: *N. grandis* (Copel. sub *Trichomanes*).

A small, well-marked genus, superficially somewhat like *Selaginella*, with larger, less rigid, more finely dissected fronds, and very different structure. More like *Callistopteris* from which it differs in the firmer texture, in habit, pubescence, and

<sup>2</sup> This name is proposed on the ground that "polyanthum" is an orthographic variant of "polyanthus" which I do not believe. The Greek equivalent of "polyanthus" is "polyanthes." If Swartz had used that word, it would invalidate Hooker's specific name. Swartz made up his mind, I am not sure what it is, but take it to be a noun used as an adjective. And a noun and an adjective are not orthographic variants.

shape of involucre. The three seem to be phyletically distinct, probably independently related to (derived from) the group of *Vandenboschia radicans*. *V. mazma* represents more definitely the source of *Nesopteris*.

Range. Loochoo and Java to Samoa; unknown on the continent, and hence named the island fern.

#### SPECIES OF NESOPTERIS

##### NESOPTERIS GRANDIS Copeland.

*Trichomanes grande* COPELAND, Ph. p. Journ. Sc. § C 6 (1911) 73, Trich. (1933) 224, pl. 40, figs. 1-4.

*Trichomanes presbuanum* NAKAI, Bot. Mag. Tokyo 40 (1926) 261.

##### PHILIPPINES JAVA

##### NESOPTERIS THYSAVOSTOMA Makino Copeland comb. nov.

*Trichomanes thysavostomum* MAKINO, Bot. Mag. Tokyo 12 (1896) 103 nomen 13 (1899) 46.

*Trichomanes blepharistomum* COPELAND, Trich. (1933) 225, pl. 41.

##### LOOCHOO; LUZON

##### NESOPTERIS INTERMEDIA (v. d. B.) Copeland comb. nov.

*Trichomanes intermedium* VAN DEN BOSCH, Ned. Kruid. Arch. 2 (1861) 129 Journ. Bot. Neerl. 1 (1861) 361, COPELAND, Trich. (1933) 226 pl. 40, fig. 5.

##### PAPUA; POLYNESIA

##### NESOPTERIS SUPERBA Backhouse Copeland comb. nov.

*Trichomanes superba* BACKHOUSE, Moore, Gard. Chron. (1862) 41 COPELAND, Trich. (1933) 221, pl. 39.

##### BORNEO.

##### 25. Genus CEPHALOMANES Presl

*Cephalomanes* PRESL, Hymen. (1843) 100 pl. 3.

Venae pinnatim exsertentes, creberrime, prominulae, non bifurcatae, venaeque sterilibus apice obtuso. Sorus in dentibus frondis obtectus terminalis, procellosus. Frondium cylindraceum, limbo patente integro. Receptaculum induratum dimidia duplove longius, rectum, apice in cylindricum apice a globum incrassatum, hinc capsula ferax. Capsula sessilis, lenticularis.

Species. *Cephalomanes nitovirens*.—PRESL, loc. cit.

Terrestrial, rhizomatous valido adscendente vel erecto, runcatus, validis obscuris sustenso; stipitibus dense fasciculatis, setosis, rigidis; fronde peruniqua lanceolata, simplice pinnata, obscura, rigidula, venis crassis saepe in dentes vel lacinias ultra marginem protensis, cellulis magnis, parietibus in proportionem tenuibus, undulatis involucri cylindricis (rarius obconicis) rigidis, receptaculo crasso longe exserto.

A small and very natural genus of the Oriental Tropics, derived from the group of *Vandenboschia radicans*. *V. auriculata* which I leave in the latter group, but which van den Bosch treated as *Cephalomanes* illustrates the course of evolution of the daughter genus. The globose tip of the receptacle, responsible for the generic name, was illusory or very exceptional, although Presl depicted it for a second species, *C. oblongifolium*.<sup>22</sup>

Range: Malaya to India and across Polynesia

SPECIES OF CEPHALOMANES

CEPHALOMANES JAVANICUM (Blume) van den Bosch.

*Cephalomanes javanicum* VAN DEN BOSCH, Hymen. Javan. 30, pl. 22.

*Trichomanes javanicum* Blume, Copeland, Trich. (1933) 246, pl. 52, fig. 1.

Java to India (and Papua?).

CEPHALOMANES SINGAPORIENSE VAN DEN BOSCH.

*Cephalomanes singaporiense* VAN DEN BOSCH, Synopses (1850) 11.

*Trichomanes singaporiense* v. A. v. ROSENBURGH, Copeland, Trich. (1933) 247, pl. 52, fig. 5.

SINGAPORE; MALAY PENINSULA; BORNEO

CEPHALOMANES SUMATRANUM (v. A. v. R.) Copeland comb. nov.

*Trichomanes sumatranum* v. A. v. ROSENBURGH, Bull. Dept. Agr. Ind.

Néerl. No. 18 (1906) 4, Copeland, Trich. (1933) 248, pl. 52, fig. 4

SUMATRA, BORNEO; ANNAM.

CEPHALOMANES OBLONGIFOLIUM Presl.

*Cephalomanes oblongifolium* PRESL, Epim. Bot. 19, pl. 10.

*Trichomanes asplenoides* PRESL, Hymen. (1843) 129, non Swartz, KUNZE, Farokh 218, pl. 20; Copeland, Trich. (1933) 249, pl. 52, fig. 2, pl. 53, fig. 10.

PHILIPPINES; AMBOINA, BORNEO; FORMOSA; SOLOMON ISLANDS.

CEPHALOMANES ATROVIRENS Presl.

*Cephalomanes atrovirens* PRESL, Hymen. (1843) 110, pl. 5, the generic type.

*Trichomanes atrovirens* Kunze, Copeland, Trich. (1933) 251, pl. 52, fig. 3, pl. 53, fig. 2.

PHILIPPINES; NEW GUINEA; QUEENSLAND

CEPHALOMANES DENSISERVITIUM Copeland.

*Trichomanes densiservitium* COPELAND, Philip. Journ. Sci. 5 C 6 (1911)

71 Trich. (1933) 253, pl. 53, fig. 3.

NEW GUINEA.

<sup>22</sup> Epim. Bot., pl. 10.

## CEPHALOMANES KINGII Copeland

*Trichomanes Kingii* COPELAND, Philip. Journ. Sci. § C 6 (1911) 72;  
Trich. (1933) 253 pl. 53, fig. 2.

## NEW GUINEA.

## CEPHALOMANES ACHROSORUM Copeland

*Trichomanes achrosorum* COPELAND, Philip. Journ. Sci. § C 6 (1911)  
72; Trich. (1933) 254, pl. 53, fig. 3.

## NEW GUINEA.

## CEPHALOMANES BORGANUM (Kunze) van den Bosch.

*Cephalomanes borganum* VAN DEN BOSCH, Synopsis (1859), 11  
*Trichomanes borganum* KUNZE, Farnkr., 354 pl. 97, COTTING, Trich.  
(1933) 254, pl. 52, fig. 4.

## POLYNESIA.

*Cephalomanes madagascariense* van den Bosch, Synopsis II,  
is a doubtful species of Christensen, Pier 4, Madagascar  
(1932) 8.

*Trichomanes Foersteri* Rosenstock, of Sumatra, is unknown to me.

*Trichomanes crassum* Copel.<sup>4</sup> is certainly *Cephalomanes*, but being known sterile only, may be suspected of being hybrid or monstrous. LEYER (Philippines).

## 26. Genus TRICHOMANES LINNAEUS

*Trichomanes* LINNAEUS, Sp. Plant. (1753) 1697

*Trichomanes* § *Achomanes* PRESL, Hymen. (1843), 105.

*Rugochloa* PRESL, Hymen. (1843) 105.

*Neurophyllum* PRESL, Hymen. (1843) 110. non Torrey et Gay

*Odontomanes* PRESL, Epim. Bot. (1849), 16.

*Neuromanes* TURPIN (1851), VAN DEN BOSCH, Synopsis \*

*Polyphyllum* VAN DEN BOSCH (1861) PLANT. pro parte minus  
aliorum

*Lacosten* VAN DEN BOSCH (1861) PLANT. pro parte minus

Although the era of our botanic nomenclature began with the publication of Linnaeus' *Species Plantarum* in 1753, genera are not defined in that work. For Linnaean generic definitions and, therefore, for the typification of his genera, we must go to earlier works of the same author.<sup>4</sup> In the case of *Trichomanes* it is

<sup>4</sup> Trich. (1933) 256 pl. 54; pl. 55, fig. 1.

<sup>5</sup> The latest rule sends us to the next subsequent edition of the "Genera" but to interpret the definition found there, we must still go back to the first edition, where the same definition is amplified by references which fix the type.



defined in the *Corollarium Genera Plantarum* (and, *teste* Underwood, in *Hortus Chifortianus*, also dated 1937): "Calyx turbatus, solarius, erectus, ex ipso margine folii stylis adnatis capsulam terminans." No species is mentioned, but reference is made to Plumer<sup>4</sup> for an illustration. This is *Trichomanes crispum*. As Linnæus's generic concept finds its first expression here, and no other species is mentioned or referred to, this species must be accepted as the type species of the genus.

The genus typified by this species may be a small but natural one pinnatifid or simply pinnate mostly bearing long soft hairs, with rather close veins tending to be parallel restricted to the American Tropics being then Presl's section *Achomanes* van den Bosch's and Prantl's genus *Ptilophyllum* or it can be a much larger, still natural, genus, including a number of such more or less definable groups, and found in all moist tropical and most warm-temperate regions. I use it in the former sense and diagnose it accordingly.

Typically terrestrial American ferns; fronds typically unimform, pinnatifid to pinnate in plan false venulets rarely present, and then between and parallel to the veins, lamina one cell thick except immediately along veins; involucre obconic to cylindric, the mouth truncate to expanded, but not valvate or bilabiate, receptacle slender and protruding; sporangia rather small, and with a limited number of wall cells.

That *T. crispum* is not congeneric with *T. scandens* L., *T. radicans* Sw., and *T. pseudiferum* L. has been the belief of nearly every author who undertook to break the huge group called *Trichomanes* in the general treatises on ferns into smaller, natural, genera. By the principles of the typification of genera now generally accepted, van der Bosch and Prantl erred in keeping the name for the larger, more primitive, cosmopolitan group of *T. radicans*, and introducing a new name, *Ptilophyllum*, for *Trichomanes* as properly typified. To this extent they had justification, that they left in *Trichomanes* the larger number of species. If, however, they had observed any rule at all they would have adopted, for the group including *T. crispum*, Presl's name *Hoguelius*, based on the nearly related *T. crinitum*, in spite of the fact that Presl erected the genus on an erroneous figure and without seeing the plant. Presl based *Cephalomanes* on an equally baseless or imaginary character; but van den Bosch re-

tained that genus and quoted Linnæus in justification: "Nomen genericum dignum alio, hec aptiore permutare non licet."

To place some limit on the number of new binomials which have to result from the typification of the genus by *T. crispum* I have contained it as broadly as I could—except as it might include *Fecia*. *Odontomanes* might almost as reasonably, as *Fecia*, be given generic status; the group is natural and definable but its affinity to *T. crispum* is reasonably clear. And, if one would give generic status to every definable and apparently natural group, *Neuromanes* could be recognized, along with *Odontomanes*.

The reduction of *Philophyllum* and *Lacosten* to one genus is a somewhat different proposition. Van den Bosch and Prantl, who are responsible for both, were careful students of these ferns. Prantl laid particular stress on the system of branching and the position of the sori. Subordinating all other considerations to these, he divided the great group which might be called *Trichomanes* after the enumeration of such more clearly distinct smaller, related groups as *Didymoglossum* (in the sense of Lessvaux), into *Philophyllum*, *Lacosten* and *Trichomanes*, the latter including *T. pyxidiferum* and *T. radicans*. Prantl's criteria are useful in some groups of ferns but not here. *Lacosten* was to be characterized by anadromic venation and paratetrasori, in distinction to *Philophyllum*, and limited dissection of the frond, in distinction to *Trichomanes*. He included in it *T. marriæ*, not knowing *T. asplenoides* Presl (properly *Cephaemanes oblongifolium*, which even until Christensen has been reduced to *T. jamaicense*, although its sori are epitact). Among American species both van den Bosch and Presl placed *T. alatum* (as *P. piluloides*) in *Philophyllum* although to me it seems clearly to be close to *Lacosten* (*T. pedicellatum*); and also to *T. laschnianum* (*T. repens*) which they left in *Trichomanes*. At this point, though, we come to what I regard as a likely genetic connection between my *Trichomanes* and that of Prantl, so that one has reasonable freedom of choice as to where he will leave *T. repens*.

Another character of generic value in many cases is the elongation of the rhizome, commonly correlated with the remoteness of the leaves, and with their arrangement, as distichous or polystichous. However good a generic character in many or

most groups, it is not even a specific character in others—*T. merfolium* for example. In *Trichomanes* it will not serve even for natural subgeneric grouping. In the family in general the elongate rhizome is primitive. Regarding *Vandenboschia* as ancestral to *Trichomanes*, I suggest *V. repens* as a primitive element in *Trichomanes*, as shown by both the slender, elongate rhizome and the dissection of the frond. But it does not appear that all species with clustered fronds, or all species with elongate rhizomes, constitute a natural group. Both types of rhizome appear even in *Lecon* derived from a *Trichomanes* group in which most of the species have the fronds clustered on a sub-erect rhizome.

Another feature of generic value in many cases, but not here, is hairiness, as hairs may be absent in the lamina or present and of particular form. Most species of section *Ptilophyllum* bear long, weak hairs. This character is unstable also in *Vandenboschia* and *Fern*.

**Range.** Tropical America, extending a little beyond the Tropics.

#### SPECIES OF TRICHOMANES

Fronds bipinnatifid. Approximately *Loxostem* van den Bosch.

**TRICHOMANES REPENS** Hedw. van den Bosch.

Tropical South America.

*T. cernuum* Desv. is a more divided form, from Central America.

**TRICHOMANES ANKERII** Parker

Trinidad to Brazil.

**TRICHOMANES TAXACEAE** Hooker.

Brazil.

**TRICHOMANES FIDICULATUM** Desvour.

Tropical America (Brazil).

The three preceding species are *Loxostem*, the following three, called *Ptilophyllum* seem to me to be as near to *Loxostem*.

**TRICHOMANES ALATUM** Swartz

West Indies to Brazil. Stipes usually tufted, rarely subremote.

**TRICHOMANES FIMBRICATUM** Hooker

Trinidad; Guiana.

## TRICHOMANES ARBESCUOLA Desvaux

West Indies to Brazil and Peru.

## TRICHOMANES ANAETHOMEN Rosenfeld

COSTA RICA

*Trichomanes bicolor* Hooker, is a more divided relative of *T. ulatum*, from the Amazon and *T. anaethomen* Christ is described as a local relative with less divided fertile fronds.

Fronds pinnate or pinnatifid, veins free: *Platophyllum* van der Bosch

## TRICHOMANES RUPESTRIS Linn

Cuba and Mexico to Uruguay. Rhizome elongate

## TRICHOMANES CRINITUM Swartz.

Jamaica and Costa Rica to Ecuador.

## TRICHOMANES CRISPUM Linnæus Fide L.

Cuba to Ecuador and Brazil. The type of the genus.

## TRICHOMANES ALCEGENS Presl.

West Indies across Brazil.

## TRICHOMANES SELLOVIANUM Presl.

Tropical America (BRAZIL)

## TRICHOMANES CRISTATUM Kaulfuss

Tropical America (BRAZIL)

## TRICHOMANES GALEOTTII Fournier

MEXICO; HONDURAS, CUBA.

## TRICHOMANES PELIOPSIS Kunze.

Tropical America (BRAZIL)

## TRICHOMANES PELOSTEM Bick.

Guiana across Brazil.

## TRICHOMANES LAXUM K.

Tropical America (BRAZIL).

## TRICHOMANES LINDIGII Fournier

COLOMBIA; BRAZIL.

## TRICHOMANES L. BOYNIANUM Ros.

COSTA RICA.

Frond pinnate, veins cross-connected by false veinlets: *Neuromanes* Trev.

*TRICHOMANES PINNATUM* Hedwig.

Cuba and Mexico to Brazil.

*TRICHOMANES VITTARIA* B. & C.

GUIANA; AMAZON.

Fertile frond simple. Frond pinnate, veinlets anastomosing.  
*Odontomanes* Presl

*TRICHOMANES HOSTMANNIANUM* Kt. & Kuhn.

GUIANA; AMAZON.

I have enumerated, with one exception, only the species in hand; and suppose that all American species which have been referred to *Polioophyllum* as genus or subgenus are correctly placed there. The Oriental species so referred by van Aderwerelt do not belong here. Prantl was likewise wrong, in principle as well as in form, in referring to *Lacostea* the Oriental *Cephalomanes*. The latter presents a most interesting example of evolution parallel in form to that of *Trichomanes* the two originating independently in *Vandenboschia*.

#### 27. Genus FEEA Bory

*FEEA* BORY, Dict. Class. d'Hist. Nat. 6 (1824) 4-6; Presl, Hymen. (1843) 102, VAN DEN BOSCH, Synopsis, 6.

*Hymenostachys* BORY, Dict. Class. d'Hist. Nat. 6 (1824, 558; 2 (1825) 462, Presl, Hymen. (1843) 103.

*Homocotyle* Presl, Abh. böhm. Ges. Wiss. V 6 (1849) 331 (not seen).

*Trichomanes suagerus* FEEA et *Hymenostachys* HOOKER, Sp. Fil. (1846) 114.

*Trichomanes* § *FEEA* HOOKER and BAKER, Syn. Fil. 71.

*Polioophyllum* § *Homocotyle* et *FEEA*, PRANTL, Hymen., 48.

Genus *Trichomanes* (ex affinitate *T. crispum*) derivatum, terrestre, rhizomate aut brevi-repente aut suberecto et radicibus validis sustentis, stipitibus subrepentibus vel caespitosis; frondibus dimorphis, sterilibus lanceolatis profunde pinnatisectis (deorsum rarius pinnatis) segmentis integris, fertilibus lineariis aliter *Trichomanes* conforme.

Tropical America, from the Amazon basin to the Caribbean, one species extending into Central America and one into the West Indies.

#### SPECIES OF FEEA

*FEEA HETEROPHYLLA* (H. B. W.) Copeland comb. nov.

*Trichomanes heterophyllum* H. B. W. in Willdenow, Sp. Pl. 5 (1810) 503.

*Homocotyle heterophylla* Presl.

*Fern. Humboldtii* VAN DEN BOSCH, Ned. Kr. Arch. 4 (1859) 247

*Fern. spruceana* VAN DEN BOSCH, Ibid.

### Amazon basin, Guiana

*FERN. DIVERSEFOLIA* (Bory) Copeland comb. nov.

*Hymenodictyon diversifolium* BORY, Dict. Class. d'Hist. Nat. 5 (1825) 462

*Fern. Boryi* AS DEN BOSCH.

### Guiana to southern Mexico and Bolivia.

*FERN. TROLLII* (Bergdahl) Copeland comb. nov.

*Tetelo waxes Trollii* BERGDHAL, Flora 127 (1893) 264 text figs.

### BOLIVIA; GUIANA?

*FERN. BOTRYOIDES* (Kaulfuss) van den Bosch.

*Trichomanes botryoides* KAULFUSS

*Fern. nana* BORY the type of the genus

### GUIANA; PANAMA; PERU.

*FERN. OSMUNDIODES* (Bory) Copeland comb. nov. Plate 9

*Trichomanes osmundoides* DC. in Poiret (Lam.) Enc. 3 (1806) 65

*Fern. polytrichum* BORY, Dict. Class. d'Hist. Nat. 5 (1824) 446

*Fern. apiculata* PRESL, Abh. böhm. Ges. V 5 (1849) 330

### Guiana to West Indies and Ecuador.

There remains *Trichomanes platyneuron* Donn., of Jamaica, which I have not seen. As it has been found but once, in a thoroughly collected locality, it seems likely to be an aberrant individual specimen of *F. osmundoides*.

These five species seem, with a sufficient measure of probability, all to be derived from the immediate group of *Trichomanes crispum*, as that species is considered in Species Filicum they may all be derived from it. On the assumption that they represent a natural derived group, I treat them as one genus, but it must be conceded that this assumption is not as well grounded as is that of their common descent from a single group. That is, they may represent two, or even three, independent derived lines, from a common source.

*Fern. heterophylla*, Presl, a genus *Homocates*, has a somewhat elongate rhizome with scirpate, not clustered, stipules. The fertile frond is pinnatifid with numerous closely placed, short, truncate segments, each (except near the apex of the frond) bearing several sori which collectively form a border on the frond. Goebel<sup>22</sup> has clearly established its affinity to *T. crispum*.

<sup>22</sup> Flora 124 (1930) 381-388.

1888." I have several of the *Luetzelburg* specimens, and so know exactly what his *T. heterophyllum* is, but cannot so definitely locate his *T. crispum*. It was like *T. hetero. adpressum* in pubescence. As to the length of the rhizome, Goebel is silent. Broadly construed, *T. crispum* includes forms variable in pubescence and in the character of the rhizome—18 species of various authors according to Synopsis Filicum 25 by this time.\*

*Feca diversifolia* (Bory's genus *Hymenostachys*) and *F. Truttm.* have entire fertile fronds, the marginal sori sunk in the lamina. The pubescence is comparatively scant and in form, distinct from that of *F. heterophylla*, but within the range of *T. crispum* s. lat. The rhizome is short and the fronds tufted, as in the typical *T. crispum*. This pair of species is treated in most detail by Bergdoll.<sup>21</sup>

*Feca botryoides* and *F. obovatoides* (Bory's genus *Feca*) have the lamina elided between the sori which stand side by side on an almost wingless rachis. The fronds are tufted on a suberect rhizome.

The fact that the plants I combine in a genus *Feca* show affinity to at least two groups of plants, whether or not the latter are well regarded as belonging in a single species, is not proof that my *Feca* is dipyletic or polyphyletic (except in the sense in which every human family becomes more so by amphimixis with each generation). Because dimorphism is a rare phenomenon in Hymenophyllaceae, it seems probable that as a genetic change (or mutation), the nearly related plants which exhibit it result from one such occurrence. The difference in rhizome and in pubescence may be the result of parallel evolution—which Bergson might have expected to happen. More probably, in my own present view, they are due to hybridization.

Some species of *Feca* have conspicuous peculiarities not found in *T. crispum* or its immediate group. Thus *F. diversifolia* has the lamina of the fertile frond several cells thick. I treat this as an important generic characteristic of *Davalliopsis* and as one such character of *Ceratiomanes* and *Hymenoglaucom*, but as of minor significance or utility in the cases of *Meconium dilatatum* and its relatives. In the case of *F. diversifolia*, it looks like an almost inevitable mechanical consequence of the congestion of the sori. Other *Feca* species show a tendency to be more

\* Maxon, Florid of Porto Rico (1926) 501.

<sup>21</sup> Flora 127 (1933) 251.

than one cell thick.<sup>24</sup> Striae (false veniets, occur in some species. *P. diversifolia* has veins excurrent from the costa, as in the group of *T. pinnatum*.

*P. diversifrons* and *P. Trolia* have anastomosing veins, a feature as unique in this family as is the dimorphism.

We have then a choice of three courses:

1. To leave these ferns in *Trichomanes*. Its ancestry is there, and there is some dimorphism at two other places in this parent genus.

2. To recognize two or three genera, here combined as *Fern*.

3. To treat the group of five species as one genus. I have chosen this course because it seems to give expression most conveniently to the noteworthy common characteristics of this group of related species.

It may be noted here, though the subject is a *Trichomanes*, that Christ referred to "Sect. Fern" as *T. amazonicum*<sup>25</sup> described as distinguished from *T. bicolor* Hooker, found at the same place, by having the fertile fronds bipinnatifid, while the sterile fronds, like a fronds of *T. bicolor*, are tripinnatifid. Christ injected this foreign element into *Fern*, and then condemned the latter for not being a natural group.

The remaining dimorphous *Trichomanes* is *T. Vahlia*, derived from *T. pinnatum*. It is the type of Presl's genus *Neurophyllum*, this name being untenable for it. It was characterized especially by the venation, and included *T. pinnatum*. Trevisan and van den Bosch called this group *Auromanes*, but its proper name, if it is treated as a genus is probably *Odonomanes*.

## 26. GENUS DIDYMOGLOSSUM Desvaux

*Didymoglossum* DESVAUX, Prod. (1827) 370.

*Didymoglossum*. Presl, Hymen. (1843) 114, VAN DEN BOSCH, Synopsis 39, partim.

*Hemiphiobium* PRESL, Hymen. (1843) 117, FRANTZ, Hymen. 45; van

*Didymoglossum* VAN DEN BOSCH, Hymen. Javan. 70; nec. Frant. et sect. *Trichomanes*, Hymen. 52.

Seri margins exserti sporangia sessilia receptacula communia; cyathodraeco innata; involucrum uniloculatum ore hiante bifidatam. Habitus *Trichomanidis*.—Desvaux, loc. cit.

Type epiphytica, radicibus (non semper?) patentibus, rhizomate filiforme, intricato, velutino; frondibus remotis aut parvis

<sup>24</sup> Mottetius, Abh. d. Math.-phys. Classe d. k. Sachs. Ges. Wiss. 7 (1866) 161.

<sup>25</sup> Hedwigia 44 (1836) 359.



aut minimas, pinnatifidis vel saepius integris margine setiferis  
venulis aut pinnatim aut flabelatum insertis, venulis spuriis in-  
terspersis; soris marginalibus, involucre elongato, ore typico bi-  
labiato, receptaculo extruso

Range: Tropical and subtropical America, across Africa to  
Ceylon, on trees and rocks in wet places.

The false veins and bilabiate involucre suggest affinity to  
*Crepidomanes* which, however, is probably very remote; the  
marginal hairs, to *Sphaerocarpon* in aspect more real affinity  
to *Trichomanes* (*Laroclea*).

#### SPECIES OF DIDYMOGLOSSUM

**DIDYMOGLOSSUM ROBINSONII** (Baker) Copeland comb. nov.

*Trichomanes Robinsonii* BAKER Journ. Linn. Soc. 9 1867) 333, p.  
6 B.

*Trichomanes montanum* Hooker non Salisb. and *T. quadrifidum* Hook.  
and Grev, non Desv. are synonymous or nearly so.

NATAL; MADAGASCAR, Tropical America

**DIDYMOGLOSSUM KRAUSSII** (Hook. and Grev.) Presl

Cuba to Brazil.

**DIDYMOGLOSSUM REPENS** (Sw.) Presl

WEST INDIES; VENEZUELA; COLOMBIA.

**DIDYMOGLOSSUM HYMENOIDES** (Medwig) Copeland comb. nov.

*Trichomanes h. megalodes* MEDWIG, Fil. Gen. et. Sp. 41799) pl. 4, fig. 9

*Trichomanes muscoides* SWARTZ (1801).

*Didymoglossum muscoides* DESVAUX, the type of the genus.

Jamaica to Brazil.

**DIDYMOGLOSSUM PUNCTATUM** Polak. Desvaux

Cuba to Brazil

**DIDYMOGLOSSUM SPHACNOIDES** Kunze Presl

Florida to Brazil

**DIDYMOGLOSSUM PESILLUM** (Sw.) Desvaux

Cuba to Venezuela; the type of *Hemphilegium*

**DIDYMOGLOSSUM SOCIALE** Fée

BRAZIL.

**DIDYMOGLOSSUM CORDIFOLIUM** Fée

WEST INDIES; GUIANA.

**DIDYMOGLOSSUM FONTANUM** (Lindb.) Copeland comb. nov.

*Trichomanes fontanum* LINDB. Arkiv. Bot. 1 (1803) 44

BRAZIL.

**DIDYMOGLOSSUM PARSTIANUM** (K. Moller) van den Bosch.

**BRAZIL.**

**DIDYMOGLOSSUM LINEOLATUM** van den Bosch.

Florida to Colombia. Without a connected veinlets. *Trichomanes Curtisii* Rosenstock, of Costa Rica is hardly distinct.

**DIDYMOGLOSSUM PETERSII** (Gray) Copeland comb. nov.

*Trichomanes Petersii* GRAY, Am. Journ. Sci. II 15 (1853) 376.

Georgia to Mississippi. The involucre is not bilabiate.

**DIDYMOGLOSSUM LIBERIENSE** Copeland.

*Trichomanes Liberiense* COPELAND, Trich. 1933) 160 p. 9, figs. 116

**LIBERIA.**

**DIDYMOGLOSSUM EXIGUUM** (Haddon) Copeland comb. nov.

*Hymenophyllum exiguum* HADDON, Ferns Brit. India (1868) pl. 276.

*Trichomanes exiguum* BAKER, COPELAND, Trich. (1933) 205, pl. 32, figs. 1-2

**CEYLON.**

**DIDYMOGLOSSUM WALLII** (Thwaites) Copeland comb. nov.

*Trichomanes Walli* THWAITES, Trimen Journ. Bot. 23 (1865) 274.

COPELAND, Trich. (1933) 200, pl. 32, figs. 3-5.

**CEYLON**

*Trichomanes Giesenkugeni* C. Chr., Comores, evidently belongs here.

*Trichomanes Barkhamii* Baker, Mauritius, may belong here, but is without false veins, and the involucre is not bilabiate.

In spite of a general indisposition to creating new binomials for species not known to me personally, I do so for the following three, because the identity of the species seems to be well established by the comparative and comprehensive study of Lindman<sup>53</sup>

**DIDYMOGLOSSUM MELANOPHYLLUM** (Baker) Copeland comb. nov.

*Trichomanes melanophyllum* BAKER, Syn. Fil. (1874) 405; LINDMAN, loc. cit. 22, figs. 11-14

**ECUADOR.**

**DIDYMOGLOSSUM MOSENI** (Lindb.) Copeland comb. nov.

*Trichomanes Mosenii* LINDMAN, loc. cit., 46, figs. 25-27, K, fig. 27.

**BRAZIL.**

<sup>53</sup> Ark. for Bot. (1903) 7-65.

*DIDYMOGLOSSUM MYRIOPHYLLON* (Lindb.) Copeland comb. nov.

*Trichomanes myriophyllum* LINDBERG, loc. cit., 48 figs. 25, A-F, 29, 20.

GUJANA; BRAZIL, COSTA RICA?

VENEZUELA.

*T. goebelianum* Gies., another "smallest of all ferns," the frond 2.5 to 3 mm long, is a *Didymoglossum* with aberrant involucre, obconic, half-immersed, with broad, unbordered lips.

## 29. Genus *LECANIUM* Presl<sup>4</sup>

*Lecanium* Presl., *Hymen.* (1843) 103, pl. 1

Costa rich. Venae flabellatae, creberrimae, subparallelae, plures furcatae, transversae apice scissae. Venulae tenuissimae in superiori parte frondis ibere exsertentes et apiculas duas oppositas supramarginales, patensiformes patentius gerentes. Sorus intramarginalis, immersus. Indusium lineari-cylindricum, elongatum, limbo hypocrateris mucoso patente crenulato. Capsulae receptaculo filiformi, indusium longe excedenti undique affixae sessiles, angustae, ciliatae, valde exsertitae (post marcescentem) affixae.

Species. *Lecanium membranaceum* (*Trichomanes membranaceum* L.).

—Presl., loc. cit.

The genus was mentioned by van den Bosch in his *Bydrugs*, and placed in his suborder *Diplophyllaceae*. Prantl<sup>5</sup> treated it as a subgenus of his *Hemipalechia*. All other authors have left it in *Trichomanes*.

<sup>4</sup>The validity of this name is challenged on two grounds. That *Achomane* Necker is an older name, validly published, and appropriate, and that *Lecanium* Presl. (1843) is invalidated by *Lecanium* Reinwardt (1825). As to the first *Achomane* Necker does seem to have been published properly under the Revised Statutes of 1830, for the first time since we had rules backed by the authority of a Congress. No species was ever named in the genus. It would have included several of the genera of later writers and Presl. *Hymenophyllaceae* 107 made a competent election among these, he restricted it (with the status of a section) to that one group, explicitly included by Necker, which is typical *Trichomanes*, typified by *T. crispum*. The same rules which for the current decade validate Necker's publication of the genus thus make it an absolute synonym of *Trichomanes*.

As to *Lecanium* Reinwardt in 1825 named a genus *Ouchianum*, typified by *O. turnerianum*. His attention being called to the prior use of this name by Kaulfuss (1820), he immediately (*Flora* (1825) 3. Beilage 48) suggested *Lecanium* as a substitute, and went on to suggest that *Lecanopteris* would be preferable, not being subject to confusion with *Lecanora*. The publication of both names, as synonyms, being thus properly tentative, both fall under Rule 40 of the Statutes of 1930. Since 1828 validated *Lecanopteris*, as correctly shown by the citation in Christensen's Index; and *Lecanium* Reinwardt did not and does not legally exist.

<sup>5</sup>Page 76.

Fronds of more than one layer of parenchyma were first ascribed to this plant by Müller,<sup>30</sup> and this was agreed to by van den Bosch. As shown by Müller, by Mettenius<sup>31</sup> and by Giesenhagen,<sup>32</sup> plural cell layers are not everywhere present. The adult plant<sup>33</sup> (Plate 10, is without roots, using metamorphosed shoots as substitutes.

Somewhat isolated in the foregoing respects, the genus is unique in its marginal scales correctly described by Presl and figured by Müller, wrongly (as pelate by Hooker,<sup>34</sup> inaccurately by Giesenhagen as spiral or snail shaped, and most completely by Mettenius<sup>35</sup> and by Maxon,<sup>36</sup> 'A pair of concave, cordate-orbicular, sessile, appressed, membranous squamules, these closely bordering the younger and smaller blades deciduous in the larger ones.' They are borne on the joint apices of two or more false veniolets, between each pair of true veniolets. They apparently serve (Giesenhagen) to hold water in the space they enclose, or eventually to maintain a measure of humidity about the thin and tender margin of the young fronds.

Range The West Indies, and from Nicaragua to Bolivia and Venezuela.

### 30 Genus SELENODI SMITH (Cephaed gen. nov.).

*Type* *Sehonance* § *Sehonance* Prantl, Hymen., (1873) 53.

*Folia* polystachya, laminae triangularis petiole fasciculus sect. transv. set. Junioris d. archus, paleae peltatae Prantl, loc. cit.

Rhizomate valido, ad terram brevi-repente vel suberecto, stipitibus approximatis vel caespitos, elongatis setis brevibus obscuris deciduis vestitis; frondibus bas. acatis plus minus rigidis, pinnulis semidissectis parte mediale plerumque integrum vixis parallelis venis deinde in segmenta monoplebia divergentibus; parietibus cellularum crassis conspicue vittatis, rarius undulatis, involucris cylindricis ore haud biabiato, receptaculo valde exserto.

A well-defined pantropic group of ill-defined species. The name probably refers to the "semilunar" cross section of the

<sup>30</sup> Bot. Zeit. 3 (1845) 517, pl. 4.

<sup>31</sup> Page 460, pl. 1, figs. 10, 11.

<sup>32</sup> Page 464, figs. 4, 5.

<sup>33</sup> Giesenhagen, 444, 445.

<sup>34</sup> Exotic Flora, pl. 76.

<sup>35</sup> Hymen., 460.

<sup>36</sup> Herod. of Porto Rico, 498.

bundle of the stipe. *Trichomanes rigidum* Sw. is the type species, but the genus reaches its "more typical" development in the Malay-Polynesian region where the remarkably thick and pitted walls and deltoid fronds are its best diagnostic characters. In America the fronds are less harsh and the walls more or less zigzag, as is true of young (and rare aberrant) Oriental specimens. The plants are strictly terrestrial and intolerant of desiccation. Stout proproots commonly support the stems of old plants above the surface of the ground. In spite of past confusion of the species, I see no evident affinity between this group and *Nesopteris*.

## SPECIES OF SELENODESMIUM

**SELENODESMIUM RIGIDUM** (Sw.) Copeland comb. nov.

*Trichomanes rigidum* SWARTZ, Prodr. (1788) 137

Tropical America (JAMAICA).

**SELENODESMIUM MANDIOCCANUM** (Raddi) Copeland comb. nov.

*Trichomanes mandioccanum* RADDI, pl. Brasil., 1 (1825) 64

BRAZIL, ? AFRICA.

**SELENODESMIUM BATRACHOGLOSSUM** Copeland.

*Trichomanes batrachoglossum* COPELAND, Trich. (1933) 244, pls. 50, 51, figs 1, 2.

LIBERIA.

**SELENODESMIUM LUPRESSOIDES** (Desv.) Copeland comb. nov.

*Trichomanes lupressoides* DESVAUX, Prodr. (1827) 339; COPELAND, Trich. (1933) 242, pl. 49.

East African Islands; ? AFRICA.

**SELENODESMIUM STYLOSUM** (Poir.) Copeland comb. nov.

*Trichomanes stylosum* POIRET, Lam. Enc. 8 (1808) 82; COPELAND, Trich. (1933) 243, pl. 51, figs 3-5.

East African Islands.

**SELENODESMIUM OBSCURUM** (Blume) Copeland comb. nov.

*Trichomanes obscurum* BLUME, Enum. (1828) 327; VAN DEN BOSCH, Nymer Java. 23, pl. 17; COPELAND, Trich. (1933) 233, pls. 43, 44

Java to India, Formosa, and Papua.

**SELENODESMIUM EXTRAVAGANS** Copeland.

*Trichomanes extravagans* COPELAND, Trich. (1933) 240, pl. 48.

LUZON

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**SELENODESMIUM DENTATUM** (V. A. M.) Copeland comb. nov.

*Trichomanes dentatum* VAN DEN BOSCH, Ned. Kruid. Arch. 51 (1861) 182; Journ. Bot. Neerl. 1 (1861) 363; COPELAND Trich. (1933) 237 pl. 45, 46.

# POLYNESIA.

**SELENODESMIUM ELONGATUM** (A. Cunn.) Copeland comb. nov.

*Trichomanes elongat* ex A. CUNN., Comp. to Bot. Mag. 2 (1834) 368; HOOKER, Ic. P. pl. 501; COPELAND Trich. (1933) 239, pl. 47, figs. 1, 2.

# NEW ZEALAND; eastern Australia.

**SELENODESMIUM LONGICOLLUM** (V. A. M.) Copeland comb. nov.

*Trichomanes longicollum* VAN DEN BOSCH Ann. Sc. Nat. IV 15 (1861) 90; COPELAND Trich. (1933) 240, pl. 47, figs. 3-5.

# NEW CALEDONIA.

## 31. Genus DAVALLIOPSIS van den Bosch

*Davalliopsis* VAN DEN BOSCH, Verste Bijdrage (1861) 323

Terrestrial, rhizome crasso adscendente, surculis caespitosis, elongatis, validis, sulcatis fasciculis triangularibus, fronde egregie magna, tri-quadrupinnatifida, basi acuta, lamina stratis tribus cellularum composita, involucri infundibuliformis ore expanso, receptaculo exserta.

Probably a single species, of tropical America

**DAVALLIOPSIS ELEGANS** (Rich.) Copeland comb. nov. Plate 11.

*Trichomanes elegans* RICH. Act. Soc. Hist. Nat. Paris 1 (1792) 14

Van den Bosch established this genus imperfectly, publishing no specific name under it, but his name fortunately was retained for subgeneric or section use by Prantl and Christensen.

The three-layered lamina<sup>10</sup> is the best diagnostic character of *Davalliopsis*. Such affinity as I see ground for suspecting is to *Selaginella*; but the wall structure of the latter is distinct and the resemblance may be superficial.

Christensen says of *T. pochypleurum* C. Chr. "Its nearest relative seems to be the American *T. elegans* Rich."<sup>11</sup> If it be indeed a *Davalliopsis*, it presents a case parallel to that of *D. dymoglossum* of possible Antarctic origin and escape by way of the Cape.

## 32. Genus MACROGLENA Copeland gen. nov.

*Trichomanes*, § *Macroglema* PREST., Abh. böhm. Ges. Wiss. V 5 (1848) 353.

<sup>10</sup> Mettenius, pl. 4, figs. 1-4.

<sup>11</sup> Bonaparte, Notes Pterid. 12 (1830) 16, fig. 5, Pterid. Madag. 6.

Terrestres et epiphyticae, rhizomate valido, elongato vel breve, stipulis remotis, confertis vel caespitosis; fronde majuscula pinnatim decomposita, axibus angustissime alatis segmentis deinde anguste linearibus vel setiformibus, rigidis, soris panto-taxis, receptaculo cupuliforme vel rarius elongato, plerumque truncato nunquam bilabiato, receptaculo exserto.

Typus, *M. meifolia* (Bory sub *Trichomanes*).

Range: Old World Tropics south to New Zealand and Madagascar.

The extremely narrow (or eventually wanting) lamina, which is the conspicuous characteristic of this genus, is obviously not a primitive character, but may with confidence be regarded as the result of reduction. As has repeatedly to be noted, reduction is likely to result in similarity of plants of diverse ancestry. There are American species of *Vandenboschia* (*Leptomanes*) which are reduced in the same manner; these are distinguished from *Macroglena* by texture, and are not subject to confusion with it. But it may be that in the Orient or South, also, this kind of reduction has occurred in more than one line, and that thus I have been led to include here some species not nearly enough related to belong in one genus.

As I construe the genus, it includes *T. strictum* of New Zealand, and is old enough to be of direct Antarctic origin. I would rather believe that the Madagascar species are of Antarctic origin independent of *T. strictum*, and *T. angustatum* of Tristan d'Acunha, which I do not know, may survive as a third independent escape from Antarctica. Some species seem to be related to *Selaginella*, this being indicated by cell structure rather than by form of frond. I regard the two genera as cognate, rather than as derived one from the other.

*Macroglena* as a genus is unspecialized either as to the length of the rhizome or the structure of the cell walls—items usually characteristic of genera in this family. The type species has undifferentiated walls, but its stipes range from remote to congested.

#### SPECIES OF *MACGLENIA*

*MACGLENIA MEI-FOLIA* Bory Copeland comb. nov.

*Trichomanes meifolium* Bory, Willebrouck, Sp. Pl. 5 (1810) 503, Kaulfuss, Enum. 265. pl. 2 CHRISTENSEN, Perid. Madagascar (1932) 7, pl. 1, figs. 18-20. COPELAND, Trich. (1930) 265.

Christensen regards this species as confined to Madagascar and Reunion. As I construe it, more broadly, including *T. Plumieri* Hooker, it ranges also from Malaya to Samoa.

**MACROGLENA CARVIFLORA** (Poir.) Copeland comb. nov.

*Trichomanes parviflorum* Poir. LAMARCK, Enc. 3 (1808) 83, CHRISTENSEN, Pterid. Madag. (1932) 7 pl. 1 figs. 10-13.

MASCARENES, farther range, to Polynesia, in doubt.

**MACROGLENA ANGUSTIMARGINATA** (Bonaparte) Copeland comb. nov.

*Trichomanes angustimargin* det. in BONAPARTE, Notes Pterid. 16 (1925) 12, CHRISTENSEN Pterid. Madag. (1932) 7 pl. 1, figs. 14-15.

MADAGASCAR.

**MACROGLENA GEMMATA** (J. Sm.) Copeland comb. nov.

*Trichomanes gemmatum* J. Sm., Hooker's Journ. Bot. 3 (1841) 417, BAKER, Syn. Fil. (1867) 87; COPELAND, Trich. (1933) 260 pl. 61, fig. 2.

MALAY PENINSULA; BORNEO.

**MACROGLENA SETACEA** (v. d. B.) Copeland comb. nov.

*Trichomanes setaceum* VAN DEN BOSCH, Ned. Kr. Arch. 5<sup>e</sup> (1891) 176, COPELAND, Trich. (1933) 260, pl. 61, fig. 2.

MALAY PENINSULA; BORNEO; PHILIPPINES.

**MACROGLENA COMPACTA** (v. A. v. R.) Copeland comb. nov.

*Trichomanes compactum* v. A. v. ROSENFUEH, Nova Guinea 14 (1934) 57, COPELAND Trich. (1933) 263, pl. 49.

NEW GUINEA.

**MACROGLENA ASAE-GRAYI** (v. d. B.) Copeland comb. nov.

*Trichomanes Asae Grayi* VAN DEN BOSCH, Ned. Kr. Arch. 9<sup>e</sup> (1891) 180; COPELAND, Trich. (1933) 264 pl. 61 fig. 1.

FILII; SAMOA; TAHITI.

**MACROGLENA FLAVO-FUSCA** (v. d. B.) Copeland comb. nov.

*Trichomanes flavo-fusum* VAN DEN BOSCH, Ann. Sc. Nat. IV 15 (1861) 88, COPELAND Trich. (1933) 264 pl. 58, fig. 2.

NEW CALEDONIA.

**MACROGLENA SCHLECHTERI** (Reaume) Copeland comb. nov.

*Trichomanes Schlechteri* BRAUN, Bot. Jahrb. 49 (1912) 10, COPELAND, Trich. (1933) 268, pl. 60.

NEW GUINEA.

**MACROGLENA LAETA** (v. d. B.) Copeland comb. nov.

*Trichomanes laetum* VAN DEN BOSCH, Ann. Sc. Nat. IV 15 (1861) 90; COPELAND, Trich. (1933) 261, pl. 57, fig. 2.

NEW CALEDONIA.

**MACROGLENA CAUDATA** (Baker) Copeland comb. nov.

*Trichomanes caudatum* BRACKENRIDGE, U. S. Expl. Exped. 16 (1854) 256, pl. 30 fig. 5; COPELAND, Trich. (1933) 262, pl. 61, figs. 3-5; pl. 58, fig. 1.

Tahiti to Queensland.



*MACROGLERA STRICTA* (Hemsl.) Copeland comb. nov.

*Trichomanes strictum* MENZIES, Hooker and Greville, Ic. Fil. (1831)  
pl. 122, (COPELAND, Flich. (1933) 25), pl. 56, figs. 3, 4.

NEW ZEALAND.

### 33. Genus *ABRODICTYUM* Presl

*Abrodictyum* PRESL, Hymen. (1843) 112, pl. 7.

Epiphyticum ad truncos filicum, rē zomate breve, parvo, stipitibus dense caespitoso, basi setosis, teretibus; fronde mediocre bipinnatifida, vel subtripinnatifida anguste elliptica, pendente, segmentis linearibus, cellulis (marginalibus exceptis) transversim elongatis, et oblique longitudinaliter instructis, parietibus conspicue vittatis; involucrio infundibuliformi, mox patente receptaculo setaceo valde elongato.

A single species, without particular evident affinity, common on tree-fern trunks in the Philippines, and reported from Celebes (Kjellberg and Christensen) and the Montecna (van den Bosch).

Van den Bosch altered the name to *Abrodictyon*.

#### SPECIES OF *ABRODICTYUM*

*ABRODICTUM CUMINGII* Presl.

A large majority of the species of the Hymenophyllaceae are found in the moist Tropics. In this sense only, the statement of Sadebeck is correct: "Das Centrum der geographischen Verbreitung ist in den Tropen."<sup>10</sup> The origin of the family, as it now exists, was Austral. Sadebeck notes that New Zealand is "fast ein zweites Centrum"; and both he and Christ, as others before them, note the wealth of these plants in Antarctic America. But these conditions seem to have been interpreted as evidence that ferns of tropic origin find there a sufficiently uniform humidity and temperature. Like the Gleicheniaceae and *Beckmannia*, as to both of which Diels notes how far south they "vordringen," the Hymenophyllaceae present most perfect geographic evidence of Antarctic origin, and of migration into, not from, the Tropics.

The Hymenophyllaceae constitute about one fourteenth of the world's fern species, and this proportion may rise to about one in twelve in the Tropics. This is the closest whole number for Borneo and Java. Eastward migration from the Malay

<sup>10</sup> Nat. Pflanzenfamilien Teil I Abt. 4 (1902) 161.

region is always assumed to be responsible for the bulk of the fern population of Polynesia. In Fiji and the Socio y Islands the proportion of Hymenophyllaceæ rises slightly, to one in ten. Diversion of this migration to the northeast extended it to Hawaii, to the southeast (if it occurred), to New Zealand. This is the process pictured by "vordringen," and if the picture were correct the composition of the fern flora of Hawaii and New Zealand should correspond reasonably to that of Malaya, for the climatic conditions of both permit the same ferns to thrive. Actually, they are one in eighteen of all Hawaiian ferns and one in five in New Zealand. Going south in New Zealand, the proportion continues to rise, reaching one in three in the Stewart Islands.<sup>11</sup> Ten species of *Hymenophyllum* are reported (Cockayne Holloway) even from the Auckland Islands beyond 50° south latitude. In the Northern Hemisphere the climate of the wet side of southern New Zealand is duplicated, in the same latitude, from Portland to Sitka, but Hymenophyllaceæ are totally absent.

In far southern America, in the narrow strip west of the Andes, the climatic conditions of New Zealand are sufficiently duplicated, and there is a similar wealth of species of ferns, although few species are common to New Zealand.<sup>12</sup> As this area, being continental, can be given only an arbitrary northern limit, I have not tried to determine the proportion of Hymenophyllaceæ to all ferns; but it will correspond roughly to southern New Zealand. Juan Fernandez is an outlying fragment of this region and its Hymenophyllaceæ (Christenson and Skottsberg, 1920), are fifteen out of forty nine ferns, not quite one in three. In the Fa Kland Islands they seem to be three out of five.

<sup>11</sup> The Hawaiian climate, as a whole is less appropriate to these ferns than that of New Zealand, but there are sufficient areas that are perfectly suitable. Hawaiian Polypodiaceæ, as a whole are obviously of Malayan origin. Of the eight Hymenophyllaceæ, only *Goniophlebium minutum* and *Polystichum heterophyllum* are possibly Malayan or near the others are endemic. *Vandreschia decurthoides* and *V. cyrtolacca*, apparently American in affinity. *V. dracunculata* and *Mercurialis* occur, far southern and two species of *Sphaerocarpon*: Antarctic (New Zealand) rather than anything else.

<sup>12</sup> Holloway, Trans. N. Z. Inst. 56 (1924) 84.

<sup>13</sup> The exact number is a question of specific identity. *Hymenophyllum taubergianum*, *H. petatum* and *Sphaerocarpon elongatum* are represented by forms which have been regarded as specifically identical.

South Africa seems never to have been as near to Antarctica as New Zealand and America have been, and its present climate would not permit a rich hymenophyllaceous flora, if it ever had one. *Mecodium rarinum* *H. tunbridgensis*, and *H. petiolatum* are represented by identical or very similar plants in New Zealand and South Africa. *Sphaerococcium Laellii* and *S. Martiana* are nearly related. *Didymoglossum Robinsoni*, first described under this specific name from Natal, is the most southern representative of its genus. If, by analogy with other genera, we impute direct Antarctic origin to *Didymoglossum*, it is the only genus (except, possibly *Dorellhopus*) that seems to have escaped from Antarctica by this route only, and this will explain its unique present range—America, Africa, and eastward only as far as Ceylon. Nothing in the family in South Africa seems, with much probability, to have had a northern origin. Because of the paucity of species this rather negative statement is all that is possible. The comparative absence of immigrants from Antarctica must be responsible for the paucity of the family in all Africa and its islands.<sup>10</sup> According to Kuhn's old figures the proportion to all ferns is one in eighteen. Even this low proportion is reached by including St. Helena and Tristan d'Acunha which may well have received their filmy ferns directly from Antarctica.

The inability of tropical Hymenophyllaceae to migrate from the Tropics is attested by their paucity in the North—five species in the United States (three of which reach only to southern Florida), and three in Europe. The Japan region has more but not nearly as many as have been described. This must be a recent element in the Japanese flora, or it should have reached America when the North Pacific climate was more favorable.

The diversity of far southern Hymenophyllaceae presents evidence of Antarctic origin as conclusive as that of wealth of species. In the first place, every genus common to America and Malaya, unless it be *Microgonium*, occurs in New Zealand, and all others except *Selenodesmium* in South Chile. As to *Microgonium*, it is doubtful whether its one American species, *M. Hookeri*, really be origin in the genus. With the genera *Hymenophyllum*, *Meringium*, *Mecodium*, *Sphaerococcium*, *Vandenboschia*, and *Selenodesmium*, New Zealand has also *Crepidopteris*

<sup>10</sup> Fil. Africa (1865).

of wide range. I cannot now authenticate the statement in my treatise on *Trichomanes*,<sup>10</sup> that *T. bipunctatum*, a *Crepidomanes*, is in New Zealand, it is common in southern Polynesia, and thence in Madagascar. Besides these large genera, New Zealand has *Carthmanes*, altogether isolated, *Polypheblum* related to *Vandenboschia*, and *Apteropteris* probably derived from *Sphaeroclonium*. *Dipluophyllum* (with another name) may be added to this list if one choose to recognize it as a genus.

Antarctic America is still richer in peculiar species and genera. With its outlying islands it has *Strapilopsis*, which has been referred to both *Trichomanes* and *Hymenophyllum*. *Hymenoglossum* is as isolated as *Carthmanes*. *Leptocaulum* shares the characteristics of *Mercurium* and *Sphaeroclonium*.

There survive then at least six genera restricted to the far South. Of the genera which either never were there or do not survive there, only *Didymoglossum* and *Microgonium* are on both sides of the Atlantic. *Didymoglossum* has a representative in Natal, which suggests Antarctic origin, it does not reach Malaya and Polynesia. *Microgonium* is doubtfully in America.

The genera which do not occur in the far South can be derived from those which survive there, in each hemisphere, locally, from the local representatives of the originally Antarctic genera, with the single possible exception of *Abradictyum*, which may be derived from *Selenodesmium* but is more isolated than any other tropical genus. With this single possible exception, then, the entire family consists of genera surviving in the far South or of the descendants of these genera. The geographic evidence is conclusive.

Evidence that Antarctica could have been the source of the family still remains to be presented, since the Antarctic continent is not now a place where any fern survives. There is not much palaeontological evidence on the subject, but two quotations may suffice as to the general fact. In the *Glaciology* of Wright and Priestly, a volume of the report of the British Antarctic Expedition, it is stated in italics: "Glacial conditions have been the exception and not the rule in Antarctica."<sup>11</sup> And "In the upper Oligocene or lower Miocene, once more a temperate to subtropical flora holds sway over some portion of the Antarctic Continent."<sup>12</sup> No approximately complete land con-

<sup>10</sup> Page 177.

<sup>11</sup> (1922) 44.

<sup>12</sup> Op. cit., 448.

nection is necessary for the dispersal of these plants. In the absence of fossils, the evidence of suitable climate is all that can be expected. If the Hymenophyllaceae of today are the descendants of Oligocene migrants from Antarctica, the elapsed time must have sufficed by its length, for then present dispersal and diversification; and, by its shortness, to account for their limited northern dispersal, and for the absence elsewhere of such very divergent or generalized (*Serpyllifera*) genera as are found in the far South.

The pan-tropic genera are *Necoum*, *Sphaerocarpum*, *Hymenophyllum*, *Mertensium*, *Vandenboschia*, and *Selenicodermum*, with which *Didymopanax* may be included, although wanting in the far eastern region. These are all found now in the far South, where their surviving species are traces of the path of their migration to the Tropics. They were evidently differentiated as genera in Antarctica, and this cannot have occurred later than early Miocene. It may have been earlier, but not indefinitely earlier.

During the warm era which ended in the Miocene, these genera presumably became differentiated and were able to emigrate. The change at the end of that era did not drive them out, except as possibly subantarctic land became habitable under the influence of the Antarctic refrigeration. Directly, the Antarctic cold merely exterminated whatever was there, very likely including older, more primitive forms which, if they had survived would let us construct the trunk of the hymenophyllaceous genealogical tree, of which we now have only these main branches, some comparatively abortive branches represented by the small genera of the far South, and the more recent branches (of the main branches), represented by the tropical genera of limited distribution.

The still earlier history of the family is more a matter of speculation unsupported, I suspect, by any fossil evidence whatever. Its locus may have been Antarctica from the time the phylum became identifiable. That there is no living representative which is unlikely to have had an Antarctic ancestor, creates a presumption against an original differentiation of the family in some other region.

Of course, the family had ancestors. These are homosporous leptosporangiate ferns, of the same general evolutionary status as Gleicheniaceae and Schizaceae, newer and "higher" than Osmundaceae, less perfectly evolved so far as the charac-

ters of the family as a whole are concerned than the Polypodiaceae and probably older than most of the polypodiaceous genera.

The general structural simplicity of the fronds, reminiscent of the mosses, was once responsible for the opinion that the Hymenophyllaceae were related to the mosses and were the most primitive ferns. The last exponent of this view was Prantl, who held it after it ceased to be reasonable. It is more curious and less reasonable to find Goebel supporting the same opinion as to the gametophyte, even in recent years. The protonema of "*Trichomanes*" is more like that of mosses than is the corresponding structure of "*Hymenophyllum*," and he regards the branched, nonthalloid protonema as the phylogenetically oldest form of the hymenophyllaceous prothallium. However complete the apparent identity of the protonema of "*Trichomanes*" and a moss, it is not evidence of affinity unless the gametophyte has an ancestry distinct from that of the sporophyte, and to a group, the Alseceae, far aside from the accepted line of fern evolution. The protonema is the least primitive gametophyte in the family just as the minute fronds of *Microgonum* etc., which Prantl regarded as the most primitive sporophytes, are really the least so.

The Hymenophyllaceae had fern ancestors. Their evolution as a family was a phenomenon of reduction, on a scale for which there is no parallel among independent (holophytic) vascular plants. On the scale of one small genus we know similar reduction of the leaf tissue in *Leptopteris*. On the scale of one tissue we know aquatics which have lost the stomata. But no other considerable family has lost the tissue differentiation of the plant leaf. And this is a fairly successful family, judged by the area it occupies, and by its wealth of genera and species and individuals. It evidently fits well a set of conditions—high humidity, weak illumination, still air—common, especially in the Tropics. Even as man may destroy its environment by removing the forest, it is not at all a vanishing family. Its prosperity, with its simplified leaves, throws instructive light on the conditions responsible for the evolution of the ordinary leaf and its tissues.

Within the family reduction continues to be the most interesting phenomenon of general evolution. *Crotophyllum*, *Microtrichomanes*, *Didymoglossum* and *Microgonum* are genera in whose evolution reduction in size, correlated with inevitable simplification in form, has been the most conspicuous element. Without transgressing the generic limits I recognize, reduction

of the same kind has been conspicuous in *Mecodium*, *Splenoclonium*, *Meringium*, *Cephalomanes*, *Dalymuginum*, *Microtrichomanes*, and *Vanderboschia*. Very many species are exceedingly plastic in the same respect, a fact responsible for a very large number of sure synonyms, and for the difficulty of assigning adults to such species as *Vanderboschia raureana*, *Mecodium pulchellum*, all common species of *Crepidomanes*, and most species of *Gonocorone* and *Selenodesmium*.

The proposal of more than thirty genera, in a family where two have been imagined to suffice, will not be welcomed by those insufficiently acquainted with these plants to understand the propriety of any larger number. Really there are very few of the thirty-three as to the propriety of which I recognize any question. *Hemiopteris* and *Amphipteris* are maintained because any other course, conserving naturalness, involves worse inconvenience. *Apteropteris* and *Utricularia* are proposed because the plants are too bizarre to go well into the large genera to which they are related, each is in its way unique among vascular plants. *Utricularia* could have been left in *Hymenophyllum*. Let the separation seem natural, facilitates the picturing of their dispersal and subsequent evolution, and leaves both genera large enough for convenience.

One can easily go farther in the recognition of genera. My predecessors have divided *Trichomanes* and *Fern* more finely and it will probably be done again. *Microgonium Hookeri* may belong in a genus by itself. *Trichomanes Hildebrandtii* and *Hymenophyllum Luningia*, both unknown to me, are described as peculiar enough perhaps to merit generic status. And a number of far southern species which I include in the cosmopolitan genera are at least very foreign elements there. This *Hymenophyllum pectinatum* may become a monotypic genus. *Diplazophyllum* may again be separated from *Mecodium*. And *Hymenophyllum denticulatum* is so far from at home in *Meringium* that I abstain from retaining it there though it belongs nowhere else. *Hymenophyllum Rensch-Praegeri* is a generic entity but may better remain unnamed as such until its fruit may be discovered.

In each of the thirty-three adopted and named genera I have listed the species I know to belong there and believe to be good species. As to the Old World species this listing is almost complete. As a matter of convenience I conclude this treatise with an index of synonyms of *Trichomanes* and *Hyme-*

nophyllum, based on Christensen's Index Filicum and its supplements, and intended for use in connection therewith. In this index will be found many such entries as *Vaccinoboschia* sp., *Mecodium* sp., and *Sphaerocentrum* sp. In such cases I abstain from a transfer of specific name because I do not personally know the species in question and, therefore, have no judgment as to the validity of the species, not because of doubt as to its genus. Experience with Oriental named species has shown a surprising proportion which seem to me not to be distinct, and this makes me fear that a general transfer of published names of American species would result in many undesirable synonyms.

## INDEX OF SYNONYMS

## HYMENOPHYLLUM

<i>H. abruptum</i> Hooker.	<i>Mecodium abruptum</i> .
<i>H. acutifolius</i> Ros.	<i>Mecodium acutifolius</i> .
<i>H. acrostichum</i> v. d. B.	<i>Mecodium polyactis</i> .
<i>H. acrostichum</i> Rostk.	<i>Mecodium denticulatum</i> .
<i>H. a. ulocatum</i> v. d. B.	<i>Mecodium</i> ?
<i>H. adnigrifolius</i> v. d. B.	<i>Sphaerocentrum</i> sp.
<i>H. acrostichum</i> Cren.	<i>Sphaerocentrum</i> sp.
<i>H. affine</i> Hooker.	id.
<i>H. Afridit</i> Ros.	<i>Mecodium Afridit</i> .
<i>H. alpinum</i> Col.	<i>Mecodium</i> vult. fulum
<i>H. alveolatum</i> C. Chr.	id.
<i>H. anabide</i> Morton.	<i>Sphaerocentrum</i> sp.
<i>H. andinum</i> v. d. B.	<i>Mecodium andinum</i> .
<i>H. angulosum</i> Christ.	<i>Mecodium angulosum</i> .
<i>H. angustifrons</i> Christ.	<i>Sphaerocentrum</i> sp.
<i>H. angustatum</i> v. d. B.	<i>Sphaerocentrum</i> sp.
<i>H. anisopterum</i> A. Peter.	<i>Sphaerocentrum</i> sp.
<i>H. antiochiense</i> Presl.	id.
<i>H. antillense</i> Jenmann.	<i>Sphaerocentrum antillense</i> .
<i>H. aquaticum</i> Mett.	<i>Mecodium</i> sp.
<i>H. Armstrongii</i> Kirk.	<i>Mitrotrichomanes</i> ?
<i>H. asperifolium</i> Kze.	id.
<i>H. asplenoides</i> Sw.	<i>Mecodium asplenoides</i> .
<i>H. atrovirens</i> Col.	<i>Mecodium australe</i> ?
<i>H. australe</i> Willd.	<i>Mecodium australe</i> .
<i>H. axillare</i> Sw.	<i>Mecodium axillare</i> .
<i>H. Babindae</i> Watts.	<i>Hymenophyllum pauriticum</i> .
<i>H. badium</i> H. and G.	<i>Mecodium badium</i> .
<i>H. Batanense</i> Fourn.	<i>Mecodium</i> sp.
<i>H. batayanum</i> Denm.	<i>Hymenophyllum Batayanum</i> .
<i>H. Boissii</i> Cope.	<i>Mecodium Boissii</i> .
<i>H. Baldwinii</i> Eaton.	<i>Calatopteris Baldwinii</i> .
<i>H. Balfourii</i> Baker.	<i>Mecodium fumaroides</i> .



- H. bamberanum* Ros.  
*H. barbatum* Baker  
*H. belkense* Ros.  
*H. bicoloratum* Copel.,  
*H. bismarckianum* Chr et  
*H. bismarckense* Sw  
*H. brevidens* Ragh.  
*H. bruceanum* Spr  
*H. buxifolium* Copel.  
*H. burnianum* Hooker.  
*H. Paschii* Ros  
*H. bulleyanum* v. d. B.  
*H. buntatum* Baker.  
*H. brachygrammum* A. Br.  
*H. brachypis* Sod.  
*H. brunneum* Ros.  
*H. brucei* Ros.  
*H. brevidens* v. A. v. R.  
*H. brevifolium* Liebm.  
*H. buchtienii* Ros.  
*H. caespitosum* Gaud.  
*H. caudatum* v. d. B.  
*H. campanulatum* Christ.  
*H. capillare* Roxb.  
*H. capitatum* Desv.  
*H. Cardianum* C. Chr.  
*H. cernuum* Christ.  
*H. caudatum* Christ.  
*H. candelatum* Mart.  
*H. cecropiifolium* Christ.  
*H. cernuum* Gepp.  
*H. chinensis* Baker.  
*H. chrysotrichum* Sturm.  
*H. ciliatum* Sw.  
*H. chinensis* Gepp.  
*H. chinensis* Copel.  
*H. compactum* Burap.  
*H. constrictum* Christ.  
*H. constrictum* Hayata.  
*H. confertum* Ros.  
*H. contortum* v. d. B.  
*H. contractile* Sod.  
*H. copelandianum* v. A. v. R.  
*H. coracanthum* Nakai.  
*H. corrugatum* Christ.  
*H. costale* Hooker.  
*H. costaricense* v. d. B.  
*H. crispum* Hayata.  
*H. crispum* v. d. B.  
*Mecodium suberectum*.  
*id*  
*Meringium* sp.  
*Meringium bicoloratum*.  
*Mecodium* sp.  
*Meringium bicolour*.  
*Meringium blandum*.  
*Mecodium polyanthos*  
*Meringium bantocense*  
*Microtrichomanes palmatifidum*.  
*Meringium holochrysum*  
*Mecodium* sp.  
*Sphaerocionium* sp.  
*Meringium brachyglossum*.  
*id*  
*Sphaerocionium* sp.  
*Mecodium* sp.  
*Meringium* sp.  
*Mecodium* sp.  
*Sphaerocionium buchtienii*  
*Serphyllopsis caespitosa*  
*Meringium* ?  
*Meringium campanulatum*  
*Mecodium* sp.  
*Sphaerocionium capillare*  
*Meringium Cardianum*.  
*Mecodium* sp.  
*Sphaerocionium* sp.  
*Mecodium caudatum*.  
*id*, (?  
*Amphipteris* sp.  
*Microtrichomanes* ?  
*Sphaerocionium* sp.  
*Sphaerocionium ciliatum*.  
*Meringium* sp.  
*Meringium* sp.  
*Mecodium fuscum*  
*Mecodium constrictum*.  
*Mecodium polyanthos*  
*Mecodium confertum*.  
*Mecodium constrictum*.  
*Sphaerocionium* sp.  
*Mecodium Reichenowianum*  
*Mecodium Weylense*  
*Mecodium corrugatum*.  
*Microtrichomanes nitidum*.  
*Mecodium costaricense*.  
*Mecodium crispum*.  
*Sphaerocionium* sp.

- H. crispatum* Walt.  
*H. crispum* H. B. K.  
*H. cristulatum* Ros.  
*H. Cuvieri* Muller.  
*H. crenatum* Cav.  
*H. rubens* Sturm.  
*H. cuneatum* Kze.  
*H. c. pressiforme* Lab.  
*H. Darwini* Hk. f.  
*H. decurrens* Sw.  
*H. dissectum* Baker.  
*H. Delavayi* Christ.  
*H. deltoideum* Fee.  
*H. deltoideum* C. Chr.  
*H. densatum* Sw.  
*H. Dendritic* Ros.  
*H. densifolium* Phil.  
*H. densum* Cav.  
*H. denticulatum* Sw.  
*H. Dupontii* Mett.  
*H. dichotomum* Bume.  
*H. dichotomum* Cav.  
*H. dichotomum* aliorum.  
*H. dicyanotrichum*.  
*H. dilatatum* Sw.  
*H. dimidiatum* Mett.  
*H. dimorphum* Christ.  
*H. dipterocarpon* A. Br.  
*H. discolor* Christ.  
*H. divaricatum* v. d. B.  
*H. Durandii* Christ.  
*H. Dusenii* Christ.  
*H. ectinocarpum* Vico.  
*H. edentatum* C. Chr.  
*H. Elberti* Ros.  
*H. elegans* Spr.  
*H. elegantissimum* Fee.  
*H. elegantissimum* v. d. B.  
*H. ellipticostrum* v. A. v. H.  
*H. emarginatum* Sw.  
*H. epiphyticum* J. W. Moore.  
*H. erosum* Bume.  
*H. exiguum* Bedd.  
*H. eximium* Kunze.  
*H. exsertum* W. D.  
*H. facklandicum* Baker.  
*H. farinosum* Hieron.  
*H. fastigiatum* Christ.  
*H. fecundum* v. d. B.  
*H. ferfeense* Brack.  
*Hecostium crispatum*.  
*Sphaerocostium* sp.  
*H. coccineum* subsp. *imperfectum*.  
*Sphaerocostium Cuvieri*.  
*Hymenoglossum crenatum*.  
*Sphaerocostium* sp.  
*Mercedium crenatum*.  
*id.*  
*Mercedium* sp.  
*Sphaerocostium* sp.  
*Hymenophyllum* is dry etc.  
*Mercedium crenatum*.  
*Sphaerocostium Cuvieri*.  
*Mercedium Humbertii*.  
*Mercedium densatum*.  
*Mercedium Dendritic*.  
*Scorpiopsis coccineum*.  
*Mercedium* ?  
*Mercedium densatum*.  
*Hemipycnanthemum crenatum*.  
*Mercedium Remyi*.  
*Mercedium denticulatum*.  
*Mercedium platyllum*.  
*Leptocarpum denticulatum*.  
*Mercedium denticulatum*.  
*Mercedium dimidiatum*.  
*Sphaerocostium* sp.  
*Amphipycnanthemum fuscum*.  
*Mercedium paniculiflorum*.  
*Sphaerocostium* sp.  
*Sphaerocostium Durandii*.  
*Scorpiopsis coccineum*.  
*Mercedium edentatum*.  
*Mercedium* sp.  
*Sphaerocostium elegans*.  
*Sphaerocostium elegantissimum*.  
*Sphaerocostium elegantissimum*.  
*Mercedium* sp.  
*Mercedium emarginatum*.  
*Mercedium polyanthum*.  
*Mercedium jamaicum*.  
*Didymoglossum exiguum*.  
*Mercedium emarginatum*.  
*Mercedium exsertum*.  
*id.*  
*Mercedium* sp.  
*Hymenophyllum barbatum*.  
*Mercedium* sp.  
*Mercedium ferfeense*.

*H. fendlerianum* Stumm.  
*H. ferox* v. d. B.  
*H. ferrugineum* Colla.  
*H. Fucula* Bory.  
*H. fuchsianum* J. Sm.  
*H. firmum* v. A. v. B.  
*H. fubellatum* Loh.  
*H. flexile* Maximo.  
*H. flexuosum* A. Cunn.  
*H. Foveyeri* Ros.  
*H. formosum* Brack.  
*H. Formoskyi* Copel.  
*H. Francovillei* v. d. B.  
*H. Frankliniana* Coll.  
*H. fraternum* Harr.  
*H. fuscum* Sw.  
*H. fuscoides* Sw.  
*H. Fusteri* Brause.  
*H. fa. savense* Nakai.  
*H. fumarioides* Wild.  
*H. Funcki* v. d. B.  
*H. fuscum* v. d. B.  
*H. fustigugense* Karst.  
*H. Gardneri* v. d. B.  
*H. geluense* Ros.  
*H. Glaucum* Baker.  
*H. glaucum* Christ.  
*H. Gollmeri* v. d. B.  
*H. gossypium* Copel.  
*H. graecorum* Pommer.  
*H. gracile* Copel.  
*H. gratum* Fee.  
*H. halconense* Copel.  
*H. Hadleri* Ros.  
*H. hamuliferum* v. A. v. B.  
*H. helioscopia* Sed.  
*H. hemipterum* Ros.  
*H. Henryi* Baker.  
*H. heterocarpum* Brusse.  
*H. Herveyi* Ros.  
*H. Hieronymi* C. Chr.  
*H. himalaicum* v. d. B.  
*H. hirsutum* Sw.  
*H. hirtellum* Sw.  
*H. holochilum* C. Chr.  
*H. holochilum* A. Peter.  
*H. Hosii* Copel.  
*H. Houstonii* Jemman.  
*H. Humberti* C. Chr.  
*H. humboldtianum* Fourn.

*Mercurium fendlerianum*.  
*Mercurium ferox*.  
*Sphaeroclonium ferrugineum*.  
*Crepidomanes bipinnatifidum*.  
*Mercurium fuchsianum*.  
*Mercurium firmum*.  
*Mercurium fubellatum*.  
*Mercurium flexile*.  
*Mercurium flexuosum*.  
*Mercurium* ?  
*Mercurium imbricatum*.  
*Pleurozia pinnatifida*.  
*Sphaeroclonium* sp.  
*Sphaeroclonium ferrugineum*.  
*Mercurium fimbriatum*.  
*Mercurium* ? (receptacle elongata).  
*Mercurium fuscoides*.  
*Sphaeroclonium* sp.  
*Mercurium polyanthum*.  
*Mercurium fumarioides*.  
*Mercurium* sp.  
*Amphipterum fuscum*.  
*Sphaeroclonium* sp.  
*Mercurium exsertum*.  
*Amphipterum geluense*.  
*Sphaeroclonium* sp.  
*Mercurium* sp.  
*Mercurium gorgonianum*.  
*id.*  
*Mercurium polyanthum*.  
*Mercurium* ?  
*Mercurium pachydermicum*.  
*Mercurium* sp.  
*Mercurium halochilum*.  
*Mercurium* sp.  
*Sphaeroclonium hemipterum*.  
*Hymenophyllum burbankianum*.  
*Mercurium* ?  
*id.*  
*Mercurium* sp.  
*Mercurium polyanthum*.  
*Sphaeroclonium hirsutum*.  
*Sphaeroclonium hirsutum*.  
*Mercurium holochilum*.  
*Sphaeroclonium* sp.  
*Mercurium Hosii*.  
*id.* (?) (sterile).  
*Mercurium Humberti*.  
*Mercurium* sp.

*H. hygrometricum* Desv.  
*H. tuberculatum* Blume  
*H. inaequale* Desv.  
*H. integrum* v. d. B.  
*H. intercalatum* Christ.  
*H. interruptum* Eke.  
*H. intricatum* v. d. B.  
*H. javalicratum* Cope.  
*H. Jameson* Hooker  
*H. japonicum* Miq.  
*H. javanicum* Spr.  
*H. johorensis* Hollum.  
*H. Jungkukii* v. d. B.  
*H. kaleturum* Jenman.  
*H. kaleturum* Stueem.  
*H. kerium* Watt.  
*H. khusanum* Baker  
*H. klakatan* Christ.  
*H. kohistanum* Presl.  
*H. Kuhn* C. Chr.  
*H. Kurzii* Prantl.  
*H. laevis* Christ.  
*H. laevigatum* Copel.  
*H. lanatum* Pêr.  
*H. lanceolatum* H. and A.  
*H. latifolium* Bonap.  
*H. Ledermannii* Brause.  
*H. Lehmannii* Hieron.  
*H. leptocarpum* Copel.  
*H. leptodictyon* K. Muller.  
*H. LeRat* Roe.  
*H. Livingii* Clarke.  
*H. Litmanowii* Mett.  
*H. Linnarugii* v. d. B.  
*H. Lindeni* Hooker  
*H. Lindigii* Mett.  
*H. lindauoides* Baker  
*H. Linum* S. S.  
*H. Lingganum* v. A. v. R.  
*H. Lobbi* Moore.  
*H. longifolium* v. A. v. R.  
*H. leptocarpum* Col.  
*H. Luffii* Hooker f.  
*H. Margillorum* Copel.  
*H. macrocarpum* v. d. B.  
*H. macroglossum* v. d. B.  
*H. macroserum* v. A. v. R.  
*H. macrothermum* Eke.  
*H. megathurum* W. Hk.  
*H. Malinigi* Mett.

*Sphaeroecium hygrometricum*  
*Mecodium imbricatum*  
*Mecodium marginale*  
*Mecodium per-gynthos*  
*Sphaeroecium* sp.  
*Sphaeroecium interruptum*  
*Mecodium intricatum*  
*Mecodium javalicratum*  
*Bursa Jamesonii*  
*Hymenophyllum barbatum*  
*Mecodium javanicum*  
*Mecodium ichmanes johorensis*  
*Mecodium Jungkukii*  
 ?  
*Sphaeroecium* sp.  
*Mecodium kerium*  
*Hymenophyllum barbatum*  
*Mecodium klakatan*  
*Mecodium* sp.  
*Mecodium Kuhnii*  
*Mecodium kohistanum*  
*Mecodium laevis*  
*Mecodium laevigatum*  
*Sphaeroecium lanatum*  
*Sphaeroecium lanceolatum*  
*Mecodium lanceolatum*  
*Mecodium Ledermannii*  
*Mecodium* sp.  
*Mecodium leptocarpum*  
*Mecodium leptodictyon*  
*Mecodium LeRat*  
 id. ?  
*Mecodium* sp.  
*Mecodium Linnarugii*  
*Sphaeroecium* sp.  
*Sphaeroecium* sp.  
*Sphaeroecium odontobolia*  
*Sphaeroecium* sp.  
*Mecodium kolakatum*  
*Mecodium Lobbi*  
*Mecodium longifolium*  
*Mecodium longicolum*  
*Sphaeroecium Luffii*  
*Mecodium Macgillii*  
*Mecodium* sp.  
*Mecodium macroglossum*  
*Mecodium macrothermum*  
*Mecodium macrothermum*  
*Mecodium megathurum*  
*Mecodium Malinigi*

- H. marginatum* H. and G.  
*H. Martianii* Brause.  
*H. Mazel* Vourn.  
*H. megalocarpum* Col.  
*H. melanochaetos* Col.  
*H. Merrillii* Christ.  
*H. meyenianum* Copel.  
*H. micans* Chr. et.  
*H. microanthum* v. d. B.  
*H. microcarpum* Desv.  
*H. microchitum* G. Chr.  
*H. microphyllum* Mett.  
*M. microserum* v. d. B.  
*H. multifolium* Schl. and Cham.  
*H. minus* A. Rich.  
*H. minusculum* Morton.  
*H. minusculum* Baker.  
*H. modestum* v. d. B.  
*H. montanum* Kirk.  
*H. Moorei* Baker.  
*H. multifidum* Sw.  
*H. multiflorum* Ros.  
*H. myriocarpum* Hooker.  
*H. nannum* Sod.  
*H. Neesii* Hooker.  
*H. nigrescens* Liebm.  
*H. nitens* R. Br.  
*H. nitidoides* Copel.  
*H. notabile* Péc.  
*H. nutansifolium* v. A. v. R.  
*H. obtusum* H. and A.  
*H. odontophyllum* Copel.  
*H. oligocarpum* Col.  
*H. oligosorum* Makino.  
*H. omeiense* Christ.  
*H. ooides* Müller and Baker.  
*H. opacum* Copel.  
*H. orbiganum* v. d. B.  
*H. orbundoides* v. d. B.  
*H. ovatum* Copel.  
*H. oxypodum* Baker.  
*H. pachydermicum* Cesati.  
*H. palmatum* v. d. B.  
*H. palmense* Ros.  
*H. paniculiformum* Presl.  
*H. patnosum* Christ.  
*H. pantolactum* v. A. v. R.  
*H. parvifolium* Baker.  
*H. parvilocarpum* Hayata.  
*H. parvulum* C. Chr.  
*Craspedophyllum marginatum*.  
*Sphaerocionium Martianii*.  
*Mecodium* sp.  
*Mecodium demissum*.  
*Microtrichomanes* (?) *Arachnopus*.  
*Meringium Merrillii*.  
*Meringium myrianthemum*.  
*Mecodium* sp.  
*Mecodium javanicum*.  
*Sphaerocionium microcarpum*.  
*Mecodium polyanthos*.  
*Mecodium* sp.  
*Mecodium polyanthos*.  
*Mecodium* sp. (*polyanthos* ?)  
 id. ?  
*Buesia trifida*.  
*Mecodium minusculum*.  
*Mecodium emarginatum*.  
*Mecodium montanum*.  
*Hymenophyllum pinnatum*.  
*Meringium multifidum*.  
*Mecodium multiflorum*.  
*Mecodium myriocarpum*  
 id.  
*Meringium denticulatum*.  
*Mecodium nigrescens*.  
*Mecodium flabellatum*.  
*Mecodium nitidoides*.  
 ?  
*Meringium* sp.  
*Sphaerocionium obtusum*.  
*Myriodon odontophyllum*.  
*Meringium multifidum*.  
*Mecodium Wrightii*.  
*Hymenophyllum herbaceum*.  
*Mecodium ooides*.  
*Mecodium opacum*.  
*Sphaerocionium* sp.  
*Mecodium polyanthos*.  
*Meringium ovatum*.  
*Hymenophyllum barbatum*.  
*Meringium pachydermicum*.  
*Microtrichomanes parvulum*.  
*Sphaerocionium palmense*.  
*Mecodium paniculiformum*.  
*Sphaerocionium* sp.  
*Mecodium polyanthos*.  
*Microgonium* sp.  
*Mecodium polyanthos*.  
*Mecodium* sp.

- H. parvum* C. Chr.  
*H. paucicarpum* Jansen.  
*H. pectinatum* Cav.  
*H. pedicularifolium* Gesati.  
*H. pellatum* Desv.  
*H. penangianum* Matthew and Christ.  
*H. pendulum* Bory.  
*H. perissum* Copel.  
*H. perperulum* v. A. v. R.  
*H. physocarpum* Christ.  
*H. piliferum* C. Chr.  
*H. pilosissimum* C. Chr.  
*H. pilosum* v. A. v. R.  
*H. plicatum* v. A. v. R.  
*H. plicatum* Kaulf.  
*H. pluristum* Kaulf.  
*H. Polakii* Tard. and C. Chr.  
*H. polyanthum* Ros.  
*H. polyanthos* Sw.  
*H. polyanthum* Hooker.  
*H. polykilum* Col.  
*H. polyodon* Baker.  
*H. Poolii* Baker.  
*H. praterisum* Christ.  
*H. Preatii* Ros.  
*H. prionema* Kanze.  
*H. procerum* v. d. B.  
*H. productoides* J. W. Moore.  
*H. productum* Kze.  
*H. prostratum* Hooker.  
*H. pseudo-tunbridgenae* Watts.  
*H. pulcherrimum* Col.  
*H. pulchrum* Copel.  
*H. pumilio* Ross.  
*H. pumilum* C. Moore.  
*H. punctiforme* Ros.  
*H. pusillum* Col.  
*H. pygmaeum* v. d. B.  
*H. pygmaeum* Col.  
*H. pyramidatum* Desv.  
*H. pyriforme* v. d. B.  
*H. quadrifidum* Phil.  
*H. radicans* K. Müller.  
*H. Ransoni* Copel.  
*H. rarinum* E. Br.  
*H. recurvum* Gaud.  
*H. reductum* Copel.  
*H. Reinwardtii* v. d. B.  
*H. remotissimum* Bonap.  
*Meconium* *lanceolatum*.  
*Meconium* (teste Morton.)  
*id.*  
*Meringium* sp.  
*id.*  
*Meringium penangianum*  
*Sphaeroclonium capillare*.  
*id.*  
*Meringium* sp.  
*Meconium thalium*.  
*?*  
*Sphaeroclonium pilosissimum*  
*Meringium pachydermicum*  
*Meconium crispatum*  
*Meringium plicatum*.  
*Sphaeroclonium plumosum*  
*id.* (?)  
*Meringium polyanthum*  
*Meconium polyanthos*  
*Callistopteris polyantha*  
*Meconium demissum*.  
*id.* (?)  
*Sphaeroclonium Poolii*.  
*Meringium praterisum*.  
*(nomen inconstitum)*  
*id.*  
*Sphaeroclonium* sp.  
*Meconium productoides*.  
*Meconium productum*.  
*Meconium prostratum*.  
*Hymenophyllum affine*  
*Meconium pulcherrimum*.  
*Meringium pulchrum*  
*id.*  
*id.*  
*Meconium polyanthos*.  
*Hymenophyllum revolutum*.  
*Meconium polyanthos*.  
*Hymenophyllum revolutum*.  
*Sphaeroclonium pyramidatum*.  
*Meringium bivalve*.  
*Meringium magellanicum*  
*Sphaeroclonium rufum*.  
*Meringium Ransoni*.  
*Meconium rarinum*.  
*Meconium recurvum*.  
*Meringium reductum*.  
*Meconium Reinwardtii*.  
*Meconium uronoides*.

- H. reniforme* Hooker.  
*H. retusilobum* Hayata.  
*H. revolutum* Col.  
*H. ricasiaefolium* Bary.  
*H. Rimbaekii* Sod.  
*H. ringens* Christ.  
*H. rukiensis* Christ.  
*H. Rolandi-Principis* Ros.  
*H. Rosenstockii* Bräuse.  
*H. rubellum* Ros.  
*H. rufescens* Kieck.  
*H. rufifolium* v. A. v. R.  
*H. rufifrons* v. A. v. R.  
*H. rufus* Vée.  
*H. rugosum* C. Chr. and Skottsberg.  
*H. ruzianum* Kze.  
*H. sabinaefolium* Baker.  
*H. salakense* Kieck.  
*H. samocense* Baker.  
*H. sanguinolentum* Bräde et Ros.  
*H. sanguinolentum* Sw.  
*H. scabrum* A. Nies.  
*H. secundum* H. and G.  
*H. semibreviale* H. and G.  
*H. semiglobum* Copel.  
*H. semiglobum* Ros.  
*H. sericeum* Sw.  
*H. Serra* Presl.  
*H. serrulatum* C. Chr.  
*H. sessilifolium* Presl.  
*H. sharleyanum* Domin.  
*H. sibthorpoides* Mett.  
*H. siliquosum* Christ.  
*H. Sivicum* Christ.  
*H. sponganum* Hooker.  
*H. Skottsbergii* C. Chr.  
*H. Smithii* Hooker.  
*H. Sodiroi* C. Chr.  
*H. sororum* v. d. B.  
*H. specabile* Mett.  
*H. sphaerocarpum* v. d. B.  
*H. spicatum* Christ.  
*H. splendens* v. d. B.  
*H. Sprucei* Baker.  
*H. Steyeri* C. Chr.  
*H. streptophyllum* Fourn.  
*H. subdensatum* Christ.  
*H. subdimidiatum* Ros.  
*H. subguttatum* v. A. v. R.  
*H. subglobellatum* Cesati.  
*Mecodium reniforme*.  
*Mecodium* sp.  
 id.  
*Meringium tenellum*.  
*Mecodium* sp.  
*Meringium* ?  
*Mecodium rukiensis*.  
 Gen. novum ined.  
*Meringium Rosenstockii*.  
*M. ringium rubellum*.  
*Mecodium rufescens*.  
*Meringium* sp.  
*Meringium* sp.  
*Sphaerocionium rufum*  
 id.  
*Sphaerocionium ruzianum*.  
*Meringium ruzianum*.  
*Mecodium salakense*.  
*Mecodium samocense*.  
*Sphaerocionium samocense*.  
*Mecodium sanguinolentum*.  
*Mecodium scabrum*.  
*Meringium secundum*.  
*Mecodium serratum*.  
*Meringium semiglobum*.  
*Sphaerocionium semiglobum*.  
*Sphaerocionium sericeum*.  
*Meringium secundum*.  
*Meringium sponganum*.  
 id. ?  
*Mecodium sponganum*.  
*Microrhynchium sponganum*.  
*Mecodium siliquosum*.  
*Sphaerocionium* sp.  
 id.  
*Mecodium* sp.  
*Meringium sponganum*.  
*Buesia* Sod. et.  
*Mecodium imbricatum*.  
*Sphaerocionium specabile*.  
*Mecodium polyanthos*  
 id.  
*Sphaerocionium splendens*.  
*Sphaerocionium* sp.  
*Mecodium sordidum* im.  
*Mecodium* sp.  
*Mecodium polyanthos*.  
*Meringium* ?  
*Meringium sordidum*.  
*Meringium Lobbi*.

- H. subobtusum* Ros.  
*H. subrigidum* Christ.  
*H. subrotundum* v. A. v. R.  
*H. subtilissimum* Kuntze.  
*H. tabulaeforme* Christ.  
*H. tabulaeforme* v. A. v. R.  
*H. tasmanicum* v. J. B.  
*H. tenellum* Kuhn.  
*H. tenerimum* v. J. B.  
*H. tenerum* v. J. B.  
*H. Thomasellii* C. H. Wright.  
*H. thuidium* Harr.  
*H. toponimbicum* Kjellberg.  
*H. tonica* Asai Kze.  
*H. torquosa* v. J. B.  
*H. torricelliana* v. A. v. R.  
*H. tortuosum* H. and G.  
*H. trapezoidale* Liebm.  
*H. Treubii* Macbr.  
*H. Trunae* Hieron.  
*H. triangulare* Baker.  
*H. trichocaulon* Th. L.  
*H. trichomanoides* v. J. B.  
*H. trichophyllum* H. B. K.  
*H. truncatum* Col.  
*H. tumbidgei* (L.) Sw.  
*H. Uvi* Christ and Gies.  
*H. undulatum* Sw.  
*H. unilaterale* Doty.  
*H. Urbani* Brause.  
*H. vacillans* Christ.  
*H. valvatum* H. and G.  
*H. veronicoides* C. Chr.  
*H. villosum* Col.  
*H. vincentianum* Baker.  
*H. vulgatum* Meyen.  
*H. viride* Ros.  
*H. vittatum* Copel.  
*H. Walleri* Mitten and Dutche.  
*H. Wercklei* Christ.  
*H. Wrightii* v. J. B.  
*H. zealandicum* v. J. B.  
*H. zollingerianum* Kuntze.  
*Sphaeroclonium subobtusum*.  
*Sphaeroclonium subrigidum*.  
*Meringium denticulatum*.  
*Sphaeroclonium ferrugineum*.  
*Mecodium tabulaeforme*.  
*Meringium pachydermicum*.  
*Mecodium australe*.  
*Meringium tenellum*.  
*Sphaeroclonium* sp.  
*Mecodium* sp.  
*Id.*  
*Mecodium thuidium*.  
*Mecodium* sp.  
*Sphaeroclonium tomentosum*.  
*Id.*  
*Meringium* sp.  
*Meringium tortuosum*.  
*Mecodium* sp.  
*Mecodium Treubii*.  
*Mecodium Trunae*.  
*Meringium triangulare*.  
*?*  
*Mecodium* sp.  
*Sphaeroclonium trichophyllum*.  
*Meringium multifidum*.  
*Id.*  
*Sphaeroclonium* sp.  
*Id.*  
*Mecodium undulatum*.  
*Hymenophyllum peltatum*.  
*Sphaeroclonium* sp.  
*?*  
*Sphaeroclonium valvatum*.  
*Mecodium veronicoides*.  
*Mecodium villosum*.  
*Mecodium macrochaetum*.  
*Meringium macrochaetum*.  
*Id. ?*  
*Meringium vittatum*.  
*Mecodium Wadleri*.  
*Sphaeroclonium Wercklei*.  
*Mecodium Wrightii*.  
*Hymenophyllum revolutum*.  
*Amphipterum fuscum*.

## TRICHOMANES

- T. abrotanifolium* v. J. B.  
*T. acedens* Ph.  
*T. acrosorum* Copel.  
*T. acutifolium* Ching.  
*Vandenboschia* sp.  
*Id.*  
*Cephalomanes acrosorum*.  
*Crepidomanes* sp.



<i>T. acutis-lobatum</i> Hayata	<i>Crepidomanes Makinoi</i>
<i>T. acutum</i> Presl.	<i>Plenymonum acutum</i> ,
<i>T. adscendens</i> Kze.	id
<i>T. africanum</i> Christ.	<i>Vandenboschia</i> ?
<i>T. alagense</i> Christ.	<i>Gonocormus alagense</i> .
<i>T. alatum</i> Sw.	id.
<i>T. alternans</i> Carr.	<i>Crepidopteris radicans</i> .
<i>T. amabile</i> Nakai.	<i>Vandenboschia radicans</i>
<i>T. amazonicum</i> Christ.	id.
<i>T. andersonianum</i> Ros.	id.
<i>T. angustatum</i> Casm.	<i>Macroglena</i> ?
<i>T. angustimarginatum</i> Bonap.	<i>Macroglena angustimarginata</i>
<i>T. Ankersii</i> Parker.	id.
<i>T. aphebioides</i> Christ.	<i>Vandenboschia aphebioides</i>
<i>T. apiculare</i> Fourn.	<i>Crepidopteris</i> sp.
<i>T. apiculatum</i> Pr.	<i>Callitopteris apiculata</i> .
<i>T. arbuscula</i> Presl.	id
<i>T. Asae-Grayi</i> v. d. B.	<i>Macroglena Asae-Grayi</i>
<i>T. asplenoides</i> Presl.	<i>Cephalomanes oblongifolium</i> .
<i>T. asiatica</i> Mett.	<i>Gonocormus</i> ?
<i>T. Asneri</i> Rucib.	<i>Microtrichomanes</i> sp
<i>T. atrovirens</i> Kunze.	<i>Cephalomanes atrovirens</i>
<i>T. auriculatum</i> Bl	<i>Vandenboschia auriculata</i> .
<i>T. axillare</i> Sod.	<i>Vandenboschia</i> sp
<i>T. badium</i> Fourn.	id
<i>T. Baldwinii</i> Copel.	<i>Callitopteris Baldwinii</i>
<i>T. barkmannianum</i> Baker.	<i>Didymoplessium</i> ?
<i>T. barnardianum</i> Bailey.	<i>Crepidomanes</i> ?
<i>T. batrachoglossum</i> Copel.	<i>Selenecladum batrachoglossum</i> .
<i>T. bauerianum</i> Endl.	<i>Callitopteris baueriana</i>
<i>T. beccarianum</i> Ceras.	<i>Microgonium beccarianum</i> .
<i>T. Beckeri</i> Krause	<i>Vandenboschia</i> sp
<i>T. biforme</i> Hooker	id.
<i>T. bilobatum</i> Nees et Bl.	<i>Crepidomanes bilobatum</i> ,
<i>T. biobatum</i> v. A. v. B.	<i>Crepidomanes bilobatum</i>
<i>T. binarginatum</i> v. d. B.	<i>Microgonium binarginatum</i>
<i>T. binniculatum</i> Presl.	<i>Crepidomanes bipunctatum</i> .
<i>T. bispinatum</i> Benth.	<i>Vandenboschia radicans</i>
<i>T. blopharistomum</i> Copel.	<i>Neopteris blopharistoma</i>
<i>T. Bonini</i> v. d. B.	<i>Selenecladum</i> (?)
<i>T. Bonnierianum</i> C. Chr.	<i>Gonocormus</i> sp.
<i>T. boninense</i> Nakai.	<i>Gonocormus</i> sp.
<i>T. boninense</i> Koidzumi.	<i>Crepidomanes</i> sp.
<i>T. boninense</i> v. A. v. B.	<i>Cephalomanes singaporeanum</i> .
<i>T. boryanum</i> Kunze.	<i>Cephalomanes boryanum</i>
<i>T. botryoides</i> Kaulf.	<i>Pteris botryoides</i>
<i>T. brachyblastum</i> Mett.	<i>Vandenboschia</i> sp
<i>T. Bradei</i> Christ.	<i>Vandenboschia</i> sp.
<i>T. brevipes</i> Baker.	<i>Crepidomanes brevipes</i> .
<i>T. Brookii</i> Copel.	<i>Gonocormus</i> sp.

- T. caespitosum* Hooker  
*T. calvescens* v. d. B.  
*T. capillatum* L.  
*T. capillatum* Tauschner  
*T. cartilagineum* Vieill. et Panchev  
*T. caudatum* Brack.  
*T. cellulosum* K.  
*T. Chevalieri* Christ  
*T. Christi* Copel.  
*T. Cocos* Christ.  
*T. cognatum* Cesati  
*T. Colensoi* Hooker f.  
*T. compactum* v. A. v. B.  
*T. conopseum* Mott.  
*T. corcovadense* v. d. B.  
*T. cordifolium* Alston.  
*T. coriolum* Bedd.  
*T. crassipilis* Wetherby.  
*T. crispipendunculatum* Copel.  
*T. crissum* Copel.  
*T. cristatum* Sw.  
*T. crispum* L.  
*T. cristatum* Kaulf.  
*T. cristatum* Baker.  
*T. Cunninghamii* C. Chr.  
*T. cuneatum* Christ.  
*T. cupressifolium* flagata.  
*T. cuneoides* Desv.  
*T. Currantii* Wetherby.  
*T. Curtii* Roem.  
*T. cuspidatum* W. B. d.  
*T. cyrtolheca* Hilleb.  
*T. dactylota* Sod.  
*T. degaensis* Wetherby.  
*T. densatoides* Gaud.  
*T. debile* v. d. B.  
*T. densatum* v. d. B.  
*T. densitermum* Copel.  
*T. dentatum* v. d. B.  
*T. dentulatum* Baker.  
*T. diaphanum* H. B. K.  
*T. dichotomum* Kae.  
*T. diffusum* Bl.  
*T. digitatum* Sw.  
*T. diversifrons* Mott.  
*T. draytonianum* Brack.  
*T. elegans* Rich.  
*T. elongatum* A. Cunn.  
*T. endlicherianum*.  
*T. englerianum* Brause  
*Serpyllapsis caespitosa*.  
*Sphaerocarponium Lyallii*.  
*Vandenboschia capillacea*  
*C. epidentum bilabiatum*  
*Sclerodermium dentatum*  
*Macrogramma emdata*.  
*Vandenboschia* sp.  
*Vandenboschia* ?  
*Crepidomanes Christi*  
*Vandenboschia* sp.  
*Microgramma beccarianum*  
*Vandenboschia Colensoi*.  
*Macrogramma compacta*.  
*Crepidopteris humilis*  
 id.  
*Didymoglossum cordifolium*.  
*Microtrichomanes nitidum*.  
 id.  
*Microgramma crassipendunculatum*.  
*Cephalomanes*.  
 id.  
 id.  
 id.  
*Microgramma ciliatum*.  
*Adiantum Cumingii*.  
*Microtrichomanes Frenckii*.  
*Vandenboschia latifrons*.  
*Sclerodermium cupressoides*.  
 id.  
*Didymoglossum lineolatum*.  
*Microgramma cuspidatum*  
*Vandenboschia cyrtolheca*  
*Vandenboschia* sp.  
 id.  
*Vandenboschia duxallii*.  
*Vandenboschia* sp.  
 id.  
*Cephalomanes densum* var.  
*Sclerodermium dentatum*  
*Microgramma Bakeri*.  
*Vandenboschia diaphana*  
*Microtrichomanes dichotomum*.  
*Gonocarpus diffusa*.  
*Microtrichomanes digitatum*  
*Fraea diversifrons*.  
*Vandenboschia draytoniana*.  
*Dactylopsis elegans*.  
*Sclerodermium elongatum*  
*Crepidopteris endlicheriana*  
*Sclerodermium* ?

- T. erectum* Brack.  
*T. erisphorum* v. d. B.  
*T. eronum* Willd.  
*T. exiguum* Baker.  
*T. exsectum* Kze.  
*T. extravagans* Copel.  
*T. fallax* Christ.  
*T. Fargesi* Christ.  
*T. ferrugineum* Fourn.  
*T. filiculoides* Christ.  
*T. fimbriatum* Backh.  
*T. flabellatum* v. d. B.  
*T. flavo-fuscom* v. d. B.  
*T. Foersteri* Ros.  
*T. fontanum* Lindb.  
*T. formosanum* Yabe.  
*T. Foxworthii* C. Chr.  
*T. Francii* Christ.  
*T. Frappieri* Cord.  
*T. Fraseri* Jenman.  
*T. fruticulosum* Janna.  
*T. fulgens* C. Chr.  
*T. furcatum* v. d. B.  
*T. Gateottii* Fourn.  
*T. Gardneri* v. d. B.  
*T. gemmatum* J. Sm.  
*T. Giesenhagenii* C. Chr.  
*T. giganteum* Bory.  
*T. Godmani* Hooker.  
*T. goebelianum* Gies.  
*T. Gostaii* Hieron.  
*T. gracile* v. d. B.  
*T. gracillimum* Copel.  
*T. grande* Copel.  
*T. guianense* Sturm.  
*T. Hartii* Baker.  
*T. Harveyi* Cart.  
*T. henricianum* Pavish.  
*T. Herzogii* Ros.  
*T. heterophyllum* HBW.  
*T. Hieronymi* Bransa.  
*T. Hillebrandtii* Kuhn.  
*T. hispidum* Mett.  
*T. holopterium* Kze.  
*T. Hookeri* Presl.  
*T. Hoopii* Baker.  
*T. hostmannianum* Kunze.  
*T. Huberi* Christ.  
*T. humile* Forster.  
*T. hymenophyllioides* v. d. B.  
*Crepidopteris Knudlicheriana*.  
*id.*  
*Microgonium eronum*.  
*Didymoglossum exiguum*.  
*Vandenboschia exsecta*.  
*Selcnodesmetica extravagans*.  
*Vandenboschia fallax*.  
*Vandenboschia* sp.  
*Selcnodesmetica dentat* n. ?  
*Crepidopteris humile*.  
*id.*  
*Microtrichomanes* sp.  
*Microgonium flavo-fuscom*.  
*Cephaemanthe* sp.  
*Didymoglossum fontanum*.  
*Crepidomanes lichenargente*.  
*Pleuromanes pallidum*.  
*Microtrichomanes Francii*.  
*?*  
*Didymoglossum* sp.  
*Didymoglossum* sp.  
*Microgonium* sp.  
*id.*  
*id.*  
*id.*  
*Macroglena geminata*.  
*Didymoglossum* sp.  
*Vandenboschia* sp.  
*Didymoglossum Peterm.*  
*Didymoglossum* sp.  
*Vandenboschia* sp.  
*Gonocormus* sp.  
*Crepidopteris gracillima*.  
*Nesopteris prunifera*.  
*id.*  
*Vandenboschia ?*  
*Nesopteris in crumena*.  
*Microgonium henricianum*.  
*Vandenboschia Herzogii*.  
*Idem heterophyllum*.  
*Microgonium* sp.  
*Microgonium ?*  
*Nesopteris superba*.  
*id.*  
*Microgonium Hookeri*.  
*Microgonium penangianum*.  
*id.*  
*id.*  
*Crepidopteris humile*.  
*Vandenboschia hymenophyllioides*.

- T. hymenoides* Hedwig  
*T. hypnoides* Christ.  
*T. ignobus* Cassi.  
*T. imbricatum* Sod.  
*T. infundibulato* v. A. v. H.  
*T. ingae* C. Chr.  
*T. insigne* B. & H.  
*T. intricatum* v. d. B.  
*T. intramarginato* l. and G.  
*T. javanicum* Bl.  
*T. johannessonae* Ba. ex.  
*T. junceum* Christ.  
*T. jurgemannoides* Fourm.  
*T. kalamocarpum* Hayata  
*T. Kalbreyeri* Baker  
*T. kuppferianum* Sturm.  
*T. Kuhnii* Weatherly.  
*T. Kingii* Copel.  
*T. Kirkii* Hooker  
*T. Kraussii* H. and G.  
*T. Kuhnii* Christ.  
*T. Kuhnii* Bedd.  
*T. lachnoides* Jenman.  
*T. lachnoides* v. d. B.  
*T. lambertianum* Hk.  
*T. latophyllum* v. A. v. H.  
*T. latulatum* (v. d. B., *Didymoglossum* -  
 -um.)  
*T. latemarginale* Laton.  
*T. latifrons* v. d. B.  
*T. latilobatum* E. Brown.  
*T. latilobatum* Copel.  
*T. latissolum* Christ.  
*T. Lauterbachii* Christ.  
*T. laurum* Kl.  
*T. Ludermanni* Brause.  
  
*T. Lichmannii* Hieron.  
*T. Leonardii* v. d. B.  
  
*T. Leptophyllum* A. Cunn.  
*T. leucum* Lee  
*T. lichenoides* Copel.  
*T. Lindigii* Fourm.  
*T. lineolatum* Hooker  
*T. liliaceae* Yabe  
*T. longicollum* v. d. B.  
*T. longifrons* N. Jau.  
*T. longilobatum* Bonap.  
*T. lucens* Sw.  
*T. Ludovicianum* Ros.
- Didymoglossum hymenoides*.  
*Vandenboschia* sp.  
*Acrostichum superba*  
 id.  
*Cephaelomanes* sp.  
*Vandenboschia ingae*.  
*Crepidomanes* sp.  
*Micropteris intermedia*.  
*Crepidomanes intramarginale*  
*Cephaelomanes javanicum*.  
*Vandenboschia johannessonae*  
*Vandenboschia* sp.  
*Crepidopteris lachnoides*.  
*Vandenboschia radicans*  
 id.  
*Didymoglossum* sp.  
 id.  
*Cephaelomanes Kingii*  
*Crepidomanes* vel *Microgonium*  
*Didymoglossum Kraussii*.  
*Selaginella* sp.  
*Crepidomanes latemarginale*.  
*Didymoglossum* sp.  
*Macroglossum lucidum*.  
 id.  
*Micropteris* ?  
*Crepidomanes latulatum*.  
  
*Crepidomanes latemarginale*  
*Vandenboschia latifrons*  
*Gonocormus latilobatus*.  
*Selaginella obscura*.  
*Vandenboschia* sp.  
*Crepidopteris humilis*.  
 id.  
*Cephaelomanes* sp. (prob. *C. striatula*.)  
*Didymoglossum* sp.  
*Crepidomanes* ? vnde sub *Microgonium*.  
*Macroglossum strictum*.  
 ?  
*Didymoglossum lichenoides*  
 id.  
*Didymoglossum lineolatum*.  
*Vandenboschia radicans*.  
*Selaginella longicollum*.  
*Vandenboschia* sp.  
 ? *Gonocormus* ?  
 id.  
 id.

- T. Luerae* F. v. M.  
*T. Lyallii* Hook. f.  
*T. Macgregoriae* Baker.  
*T. macleodensis* v. d. B.  
*T. madagascariensis* Moore.  
  
*T. Majorae* Watts.  
*T. Makinoi* C. Chr.  
*T. malacae* Brause.  
*T. manducorum* Radd.  
*T. Marshallii* Hooker.  
*T. Martensii* Ravenna.  
*T. Martiana* Presl.  
*T. Matthei* Christ.  
*T. maximae* Bl.  
*T. megalostomum* Copel.  
*T. meisei* H. B. K.  
*T. melanopus* Baker.  
*T. melanotrichum* Schlecht.  
*T. membranaceum* L.  
*T. Merrittii* Copel.  
*T. Mettense* C. Chr.  
*T. myrsinaceum* v. d. B.  
*T. myrsinace* Hier.  
*T. microcarpum* Baker.  
*T. microphyllum* Copel.  
*T. Muhlenbergii* Brause.  
*T. Muniti* v. d. B.  
*T. munderensis* Christ.  
*T. muricatum* v. A. v. R.  
*T. muricatum* v. A. v. R.  
*T. muricatum* Bl.  
*T. Miyakei* Yabe.  
*T. montanum* Hooker.  
*T. Masseyi* Lindb.  
*T. Motleyi* v. d. B.  
*T. muscolinae* Brause.  
*T. myrsinaceum* Lindb.  
*T. nascentum* Christ.  
*T. Neumannii* Kuhn and Luersg.  
*T. nipponicum* Nakai.  
*T. nitidulum* v. d. B.  
*T. novo guineense* Brause.  
*T. nummularium* C. Chr.  
*T. Nymanii* Christ.  
*T. obscurum* Bl.  
*T. ophioides* C. Chr.  
*T. olacum* v. d. B.  
*T. orbiculare* Christ.  
*T. orientale* C. Chr.  
*T. ornatum* v. d. B.  
  
*Macroglossa lactea*.  
*Sphaerostichum Lyallii*.  
*Mercurium Macgregoriae*.  
*id.*  
*Cephalomanes madagascariense* v. d. B.  
  
*Crepidomanes* sp.  
*Crepidomanes Makinoi*.  
*Cephalomanes* sp.  
*Selenodermum manducorum*.  
*Gonocormus* sp.  
*Vandenboschia* sp.  
*id.*  
*Microtrichomanes* sp.  
*Vandenboschia maximae*.  
*Crepidomanes megalostomum*.  
*Macroglossa meifolia*.  
*Didymoglossum melanopus*.  
*Vandenboschia* sp.  
*Lecanum membranaceum*.  
*Macroglossa uclaea*.  
*Vandenboschia* ?  
*Mercurium megalanthum*.  
*id.*  
*Macroglossa polyantha*.  
*Crepidomanes Christi*.  
*Vandenboschia* sp.  
*Macroglossa caudata*.  
*Macroglossum maderense*.  
*Crepidomanes bili bilitum*.  
*Macroglossum beccarianum*.  
*Gonocormus minutus*.  
*Vandenboschia* sp.  
*Didymoglossum Robinsonei*.  
*Didymoglossum Alcockii*.  
*Macroglossum Moultonii*.  
*Gonocormus minutus*.  
*Didymoglossum myrsinaceum*.  
*Vandenboschia radicans*.  
*Crepidopteris endlicheriana*.  
*Vandenboschia* sp.  
*Microtrichomanes nitidulum*.  
*Gonocormus* ?  
*Macroglossum nummularium*.  
*Crepidomanes Nymanii*.  
*Selenodermum obscurum*.  
*Macroglossum ophioides*.  
*id.*  
*Didymoglossum* sp.  
*Vandenboschia radicans*.  
*id.*

- T. osmundoides* DC.  
*T. pabettianum* K. Mül.  
*T. pachyphlebium* C. Chr.  
*T. pallidum* Bl.  
*T. palmatifidum* K. Mül.  
*T. palmicola* v. d. B.  
*T. palmifolium* Hayata  
*T. paniculatum* v. A. v. R.  
*T. papillatum* K. Mül.  
*T. papuanum* Blume  
  
*T. paradoxum* Donn.  
*T. pervisorum* Poir.  
*T. parvulum* Poir.  
*T. parvulum alternum*  
*T. parvum* Copel.  
*T. pedicellatum* Desv.  
*T. pellucens* Kze.  
*T. pennatum* Kaulf.  
*T. perpusillum* v. A. v. R.  
*T. perpusillum* v. A. v. R.  
*T. Petersii* A. Gray.  
*T. philippianum* Sturm.  
*T. piliferum* v. A. v. R.  
*T. pilosum* Raddi.  
*T. pinatifidum* v. d. B.  
*T. pinnatifidum*, Jenman.  
*T. pinnatum* Hedwig.  
*T. platyrrhynchum* Domin.  
*T. plicatum* Hedd.  
*T. Pluma* Hooker.  
*T. plumosum* Kze.  
*T. Poeppigii* Presl.  
*T. polyanthum* Hooker.  
*T. polyodon* Copl.  
*T. polypodioides* J.  
*T. Powellii* Baker.  
*T. prehaenum* Nakai.  
*T. procerum* Fee.  
*T. proliferum* Blume.  
*T. pseudo-arbuscula* v. A. v. R.  
*T. pseudocapillatum* v. A. v. R.  
*T. pulcherrimum* Copel.  
*T. pumilum* v. d. B.  
*T. punctatum* Christ.  
*T. punctatum* Poir.  
*T. pusillum* Sw.  
*T. pygmaeum* C. Chr.  
*T. pyxidiferum* L.  
*T. quercifolium* Nakai.  
  
*Fern osmundoides*,  
*Didymoglossum pabettianum*,  
*Lava lopsia* ?  
*Pleuromanes pallidum*,  
*Microtrichomanes palmatifidum*,  
*Didymoglossum* sp.  
*Crepidomanes leucoglossum* ?  
*(Crepidomanes ?)*  
*Selenodesmium obscurum*,  
*Microgonium* v. A. v. R., *sublimatum*  
  
*Didymoglossum* ?  
*Macroglossum parviflorum*,  
*Microtrichomanes parvulum*,  
*Gonocorinus minutus*  
*Vandenboschia parva*,  
*id.*,  
*id.*  
*Trichomanes pinatum*,  
*Crepidopteris* ?  
*Crepidomanes perpusillum*,  
*Didymoglossum Petersii*,  
*Vandenboschia philippiana*,  
*Microtrichomanes* sp.  
*id.*  
*id.*  
*Didymoglossum* sp.,  
*id.*,  
*Fern* sp.,  
*Crepidomanes* sp.,  
*Macroglossum multifidum*,  
  
*Trichomanes polypodioides* ?  
*Callitopteris polyantha*,  
*Selenodesmium elongatum*,  
*id.*  
*Microtrichomanes vitense*,  
*Nesopteris grandis*,  
*id.*  
*Gonocorinus prolifer*,  
*Selenodesmium* ?  
*Crepidomanes* sp.,  
*Vandenboschia aphidoides*,  
*Selenodesmium denatum* ?  
*Crepidomanes bipunctatum*,  
*Didymoglossum punctatum*,  
*Didymoglossum pusillum*,  
*Crepidomanes vel Microgonium*,  
*Vandenboschia pyxidifera*,  
*Vandenboschia radicans*.

- T. racemulosum* v. d. B.  
*T. radicans* Sw.  
*T. recedens* Ros.  
*T. reniforme* Forster  
*T. repens* Sw.  
*T. rhizophyllum* Slosson  
*T. rhomboides* J. Sm.  
*(C. rhomboides* v. d. B. =  
*T. Rodingii* Copel.  
*T. rigidum* Sw.  
*T. Robinsonii* Baker.  
*T. robustum* Fourn.  
*T. roemerianum* Ros.  
*T. rotundifolium* Jermann.  
*T. Rosensloeki* v. A. v. R.  
*T. Rothensis* v. A. v. R.  
*T. rotundifolium* Bonap.  
*T. rupestre* v. d. B.  
*T. rupicola* Rostk.  
*T. saevius* L. exorb.  
*T. saxatile* Moore.  
*T. saxifragoides* Presl.  
*T. Sayeri* F. Müller and Baker  
*T. scandens* L.  
*T. Schlechteri* Brause.  
*T. schmidianum* Zenker  
*T. schomburgkianum* Sturm.  
*T. Schultzei* Brause.  
*T. Seemannii* Carr.  
*T. sellowianum* Presl.  
*T. serratifolium* Ros.  
*T. serratum* Baker.  
*T. setaceum* v. d. B.  
*T. setiferum* Baker.  
*T. siamense* Christ.  
*T. stathopneum* Bory.  
*T. singaporeanum* v. A. v. R.  
*T. minutum* Bonap.  
*T. sociale* L. exorb.  
*T. societense* J. W. Moore.  
*T. solitarium* Jermann.  
*T. Sonnei* Nakai.  
*T. speciosum* Willd.  
*T. sphenoides* Kunze.  
*T. spinulosum* Phil.  
*T. stenosiphon* Christ.  
*T. strictum* Menzies.  
*T. styliform* Parl.  
*T. subdeltoideum* C. Chr.  
*T. subulatum* v. d. B.  
*Scenodesmium obscurum*.  
*Vandenboschia radicans*.  
*Crepidomanes Christi*.  
*Cardiomanes reniforme*.  
*Didymoglossum repens*.  
*Didymoglossum* sp.  
*Cephalomanes alv. v. d. B.*  
*C. javanicum*.  
*Microtrichomanes Ruffin.*  
*Scenodesmium rigidum*.  
*Didymoglossum Robinsonii*.  
*Id.*  
*? (Meriania?)*  
*?*  
*Cephalomanes singaporeanum*.  
*Crepidomanes Rotherii*.  
*Microgonium caeruleum*.  
*Id.*  
*Crepidomanes ruficorne*.  
*Pleuromanes polidum*.  
*Scenodesmium obscurum*.  
*Gonogonium minutum*.  
*Microgonium* sp.  
*Vandenboschia alluaudi*.  
*Macroglossum Schlechteri*.  
*Vandenboschia schmidiana*.  
*Trichomanes punctatum*.  
*Macroglossum* sp.  
*Scenodesmium dentatum*.  
*Id.*  
*Vandenboschia serratifolia*.  
*Meriania Lobdu.*  
*Macroglossum setaceum*.  
*Didymoglossum* sp.  
*Scenodesmium obscurum*.  
*Microtrichomanes parvulum*.  
*Cephalomanes singaporeanum*.  
*Vandenboschia* sp.  
*Didymoglossum socium*.  
*Callistopteris polyantha*.  
*Didymoglossum punctatum*.  
*Vandenboschia* sp.  
*Vandenboschia* sp.  
*Didymoglossum sphenoides*.  
*Leptocarpum microtrichum*.  
*Vandenboschia stenophyllum*.  
*Macroglossum strictum*.  
*Scenodesmium styliform*.  
*? (Macroglossum?)*  
*Id.*

- T. sublimbatum* K. Müller  
*T. subpinnatifidum* v. d. B.  
*T. subtilissimum* Brause.  
*T. subtrifidum* Matthew and Christ.  
*T. suffrutex* v. A. v. R.  
*T. sumatranum* v. A. v. R.  
*T. superbum* Backh.  
*T. tacinatum* Copel.  
*T. tamarisciforme* Jacq.  
*T. tanaicum* Hooker.  
*T. tenerum* Spr.  
*T. tenue* Backh.  
*T. tenuissimum* v. d. B.  
*T. teretecaulis* Ching.  
*T. Teyssmannii* v. d. B.  
*T. thysanostomum* Mak.  
*T. Torae* Christ.  
*T. trichophorum* v. A. v. R.  
*T. trichophyllum* Moore.  
*T. trigonum* Less.  
*T. truncat.* Baker.  
*T. Trutli* Bergdolt.  
*T. Türekhanii* Christ.  
*T. Ujichii* Kummert.  
*T. Ulla* Christ.  
*T. varians* v. A. v. R.  
*T. Vaupelii* Brause.  
*T. venosum* R. Br.  
*T. venulosum* Copel.  
*T. vestitum* Baker.  
*T. Vieillardii* v. d. B.  
*T. virgatulum* v. d. B.  
*T. viridans* Mett.  
*T. vitense* Baker.  
*T. Vittoria* D. C.  
*T. Walleri* Walla.  
*T. Wallii* Thwaites.  
*T. Watsburgii* Christ.  
*T. Wernerii* Bas.  
*T. Welden* Rusley.  
*Microgontium sublimbatum*  
*Gonocormus minutus*.  
*Gonocormus* sp.  
*Gonocormus minutus*.  
*Cephalomanes* sp.  
*Cephalomanes uncinatum*.  
*Acropteris superba*.  
*Microtrichomanes tacinatum*.  
*Selenodermum* sp.  
 id.  
*Vandenboschia tenera*.  
*Crepidopteris evulcheriana*.  
*Vandenboschia* sp.  
*Selenodermum tereticaulum*.  
*Gonocormus Teyssmannii*.  
*Neopteris thysanostoma*.  
*Crepidomanes Mulinae*.  
*Meringium* sp.  
*Macropodia setacea* ?  
 id.  
*Gonocormus* sp.  
*P. a. Trullii*.  
 id.  
*Trichomanes polypodioides*.  
*Vandenboschia* sp.  
*Microgontium binax, uncin.*  
*Crepidopteris* sp.  
*Polypodiobium venosum*.  
*Crepidomanes venulosum*.  
*Meringium pachylernaeum*.  
*Crepidopteris Vieillardii*.  
*Vandenboschia* sp.  
*Crepidomanes latimarginale*.  
*Microtrichomanes vitense*.  
 id.  
*Crepidomanes* ?  
*Didymoglossum Wallii*.  
*Selenodermum* ?  
*Crepidopteris Wernerii*.  
*Vandenboschia* ?



## ILLUSTRATIONS

[The plates show only those genera not illustrated in my treatises on Trichomanes and Hymenophyllum. The drawings are by A. Schuman.]

### PLATE 1

*Apteropteris Malingi* (Hooker) Copel., *J. Th. Rostk.* 1, Frond,  $\times 0.5$ , 2, transverse section of segment,  $\times 235$ , 3, sorus, laid open,  $\times 29$ ; 4, sporangium,  $\times 77$ .

### PLATE 2

*Ruebia Sodrei* (C. Chr., Copel., *J. Rimbach.* 1, Frond,  $\times 0.5$ ; 2, cells,  $\times 380$  3, sorus,  $\times 145$ , 4, receptacle,  $\times 145$  5, sporangium,  $\times 77$

### PLATE 3

*Leptocarpus dicranotrichus* Presl, *J. Goidtkei* 1, Frond,  $\times 1.5$ ; 2, hairs,  $\times 77$ ; 3, cells,  $\times 380$ , 4, sorus,  $\times 29$ , 5, sporangium,  $\times 77$ .

### PLATE 4

*Syzyllopsis caespitosa* (Griseb.) C. Chr., *J. Capt. Dow*, ex U. S. Nat. Herb. 1, Plant,  $\times 1.5$ ; 2, cells  $\times 380$ , 3, trichome  $\times 77$  4, sorus,  $\times 29$ ; 5, sporangium,  $\times 77$

### PLATE 5

*Hymenoglossum crinitum* (Lam.) Presl, *J. p. Claude Joseph* ex Herb. Univ. Calif. 1, Frond,  $\times 0.5$ ; 2, cells, surface view,  $\times 380$ ; 3, transverse section of margin of frond,  $\times 235$ , 4, sorus,  $\times 29$ , 5, receptacle,  $\times 29$ , 6, sporangium,  $\times 77$

### PLATE 6

*Cardaminea veniformis* (Forster) Presl *J. Th. Rostk.* 1, Frond,  $\times 0.5$ , 2, cells, surface view  $\times 380$ , 3, transverse section,  $\times 235$  4, sorus,  $\times 29$ , 5, sporangium,  $\times 77$ .

### PLATE 7

*Polypodiopsis venosum* (R. Br.) Copel., *J. Th. Rostk.* 1 and 2, Frond,  $\times 1$ , 3, cells,  $\times 380$ , 4, sorus,  $\times 29$ ; 5, receptacle,  $\times 145$ , 6, sporangium,  $\times 77$ .

### PLATE 8

*Trichomanes crispum* L., *J. Underwood*, in Jamaica. 1, Frond,  $\times 0.33$ ; 2, cells,  $\times 253.3$ ; 3, sorus,  $\times 19.3$ ; 4, sporangium,  $\times 51.3$ .

## PLATE 9

*Fern acuminatula* (DC.) Copol., l. *Tendula*, in Costa Rica, ex Herb. Univ. Calif. 1, Frond,  $\times 0.7$ ; 2, cells  $\times 2.5$ ; 3, sorus,  $\times 20$ ; 4, sporangium,  $\times 77$ .

## PLATE 10

*Leucium membranaceum* (L.) Presl., l. *Watt*, a Jamaica 1 and 2, Frond,  $\times 0.5$ , 3, marginal suture,  $\times 38.5$ ; 4, cells surface view,  $\times 380$ , 5 transverse section,  $\times 235$ , 6, sorus  $\times 14.5$ ; 7, sporangium,  $\times 77$ .

## PLATE 11

*Dacalopsis elegans* (R. Ch.) Copol., l. *flauer* in Brazil (Bahia), 1, Frond,  $\times 0.33$ , 2, cells, surface view,  $\times 253.3$ ; 3, transverse section,  $\times 156.0$ , 4 sorus,  $\times 19.3$  5, sporangium,  $\times 51.3$ .

## TEXT FIGURE

Diagram of affinities of genera.

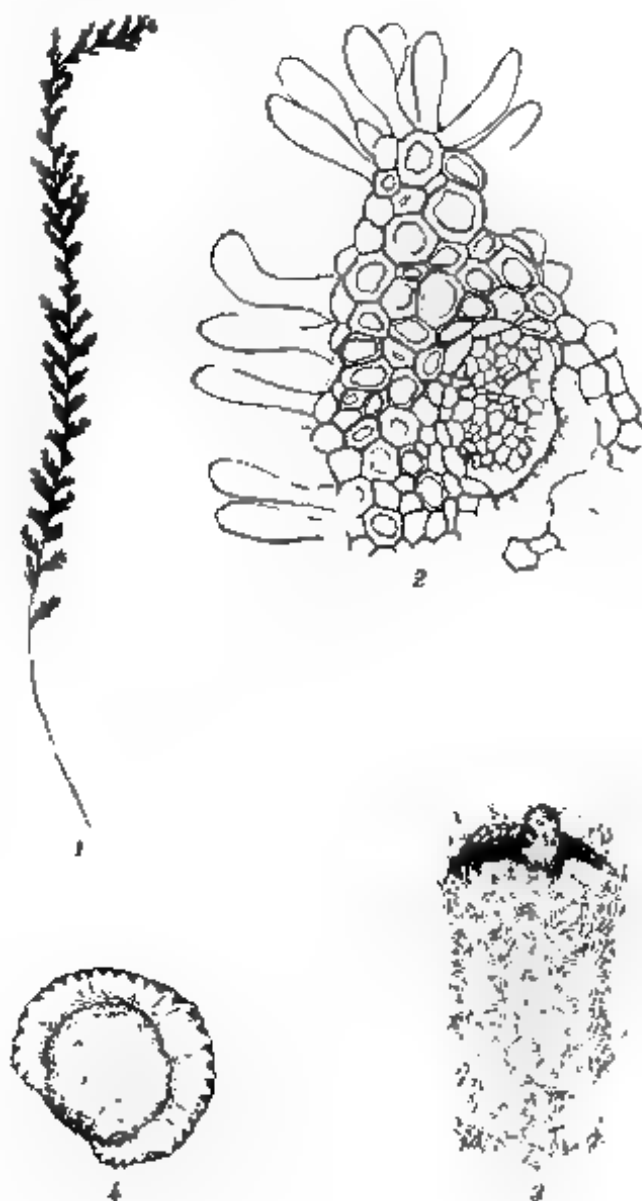


PLATE 1.

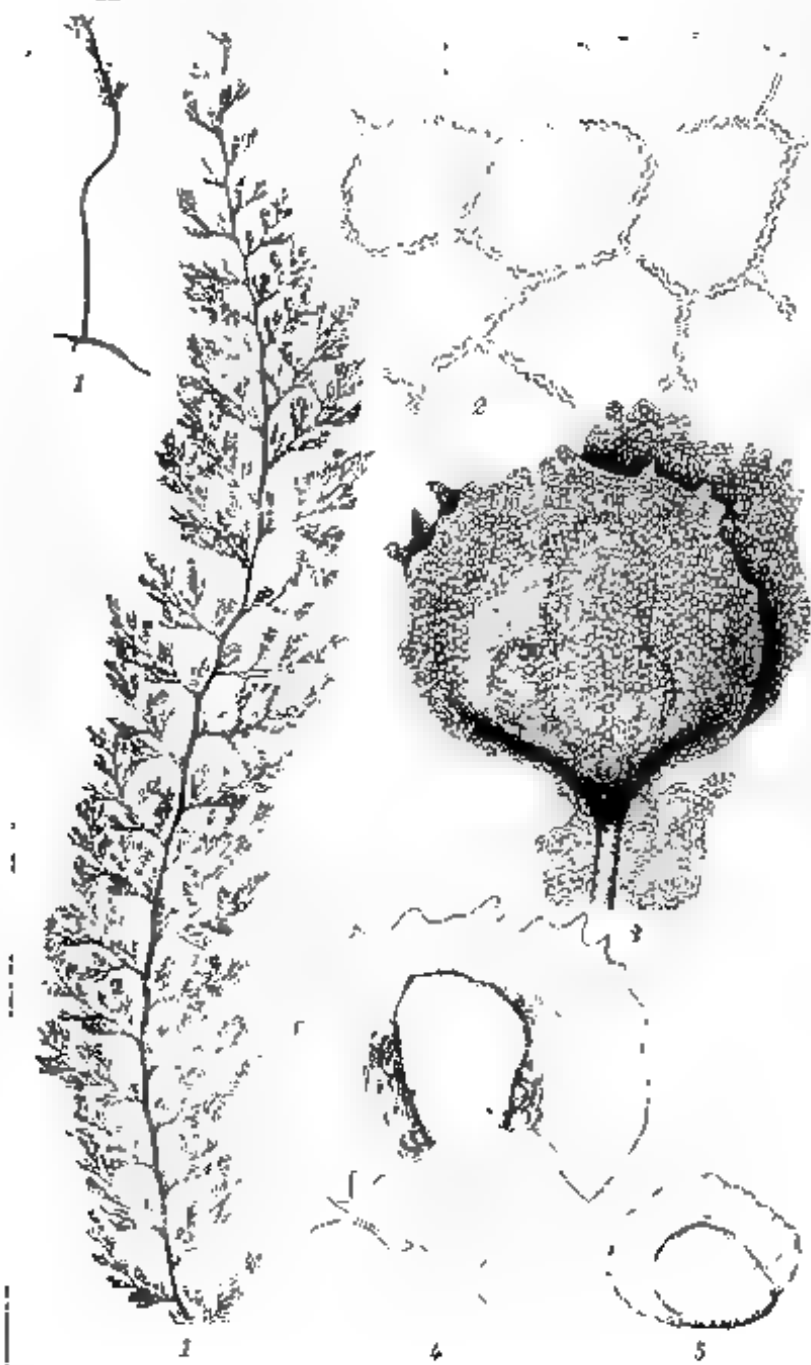


PLATE 2



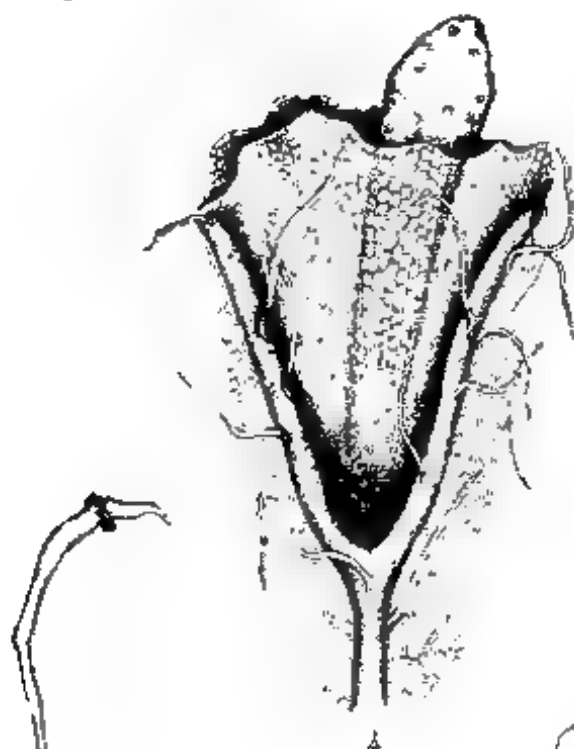
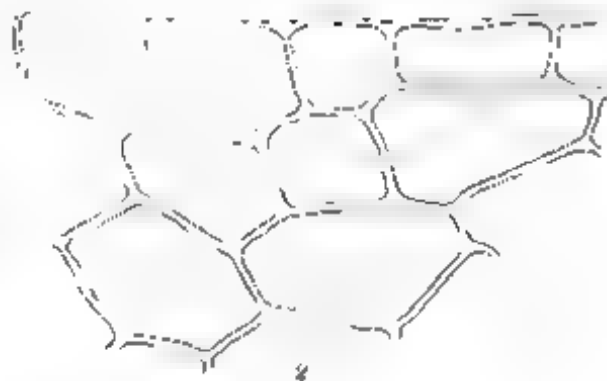


PLATE I

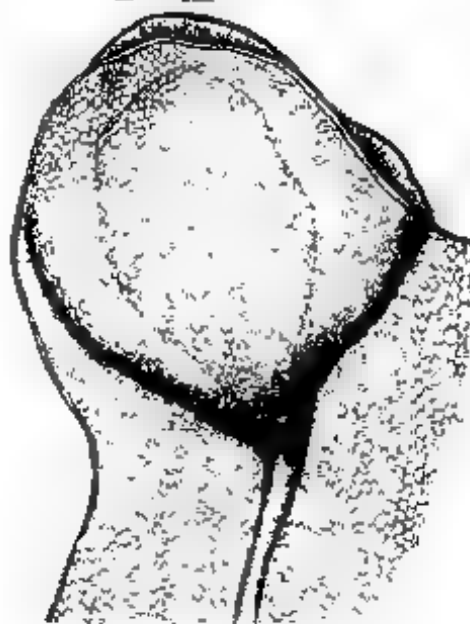


PLATE 5.

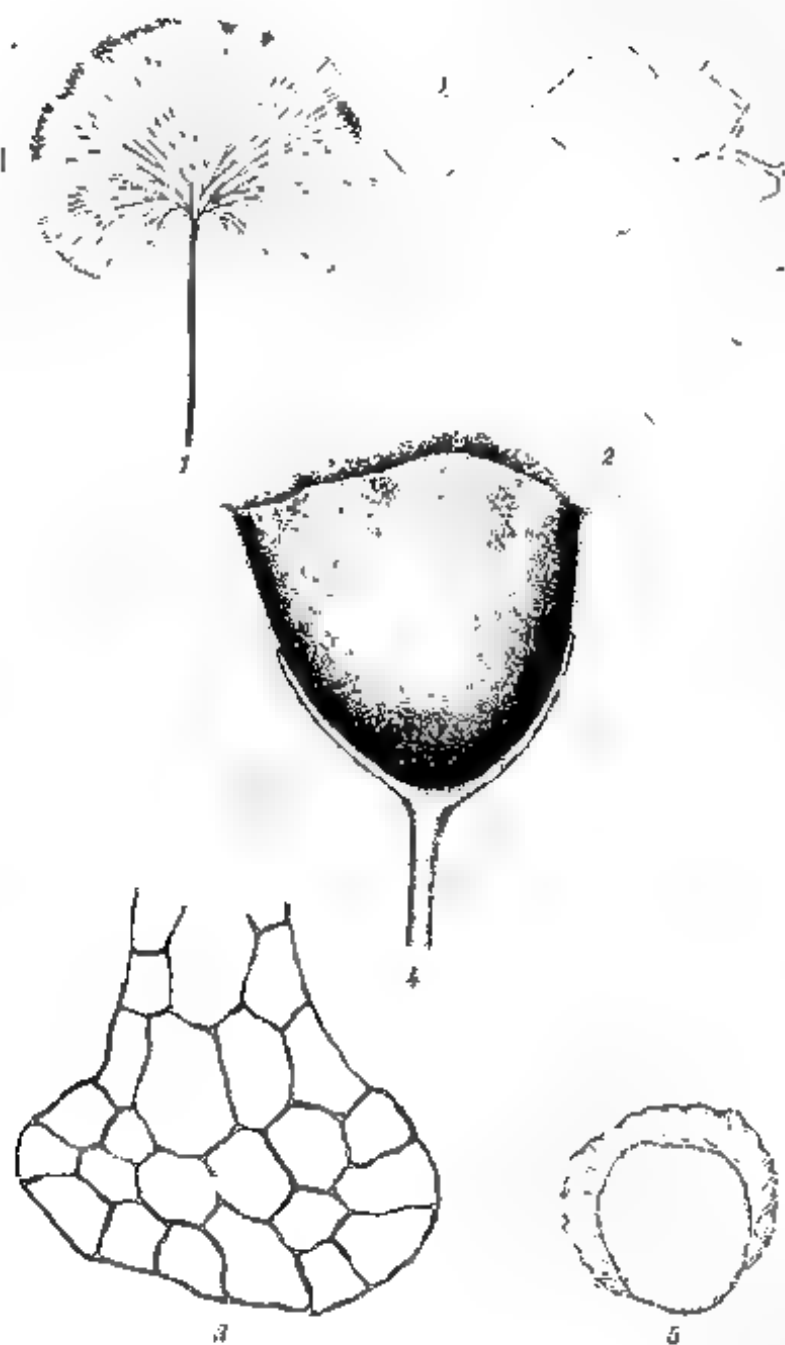


PLATE 1.





PLATE 7.

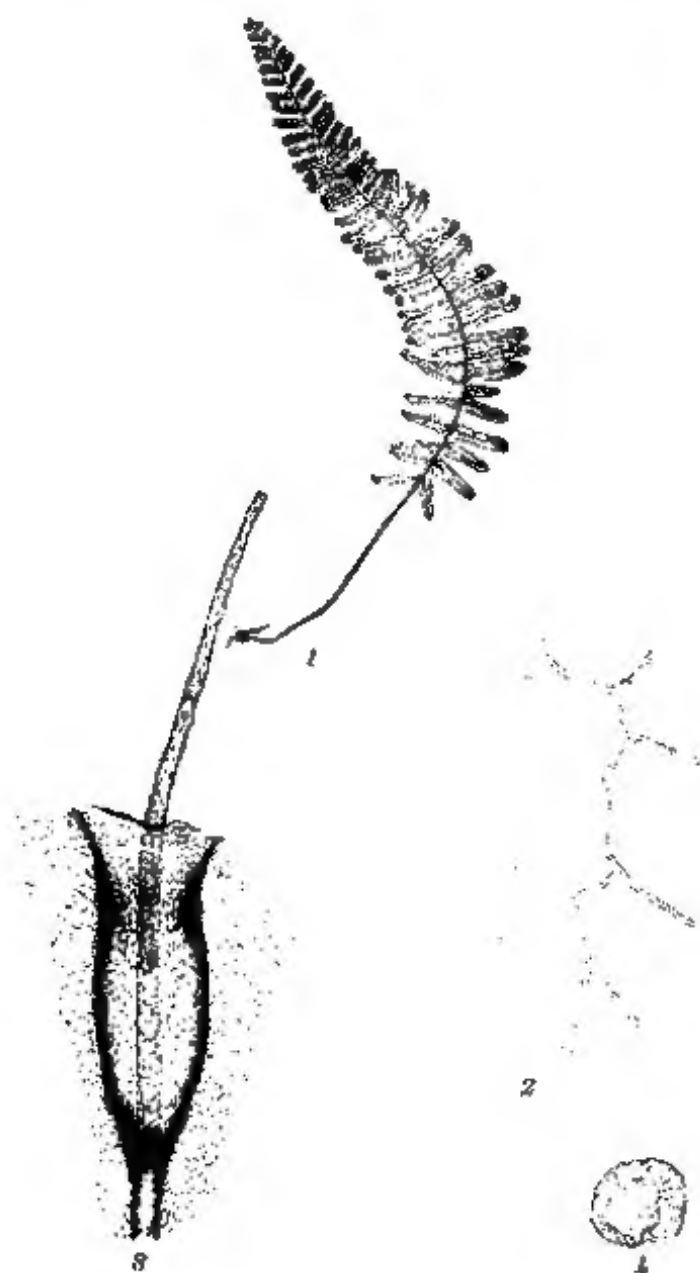
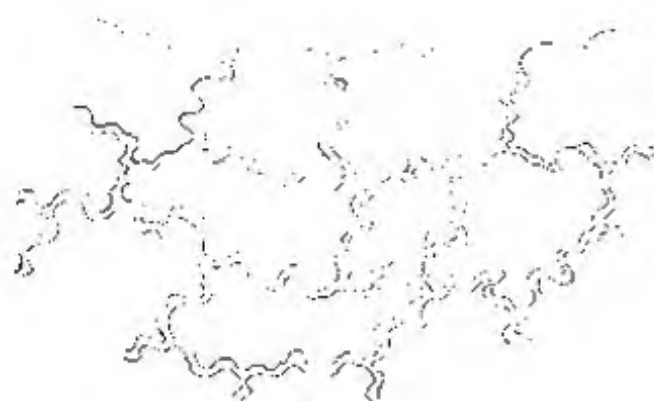


PLATE I.



2



3



4



5

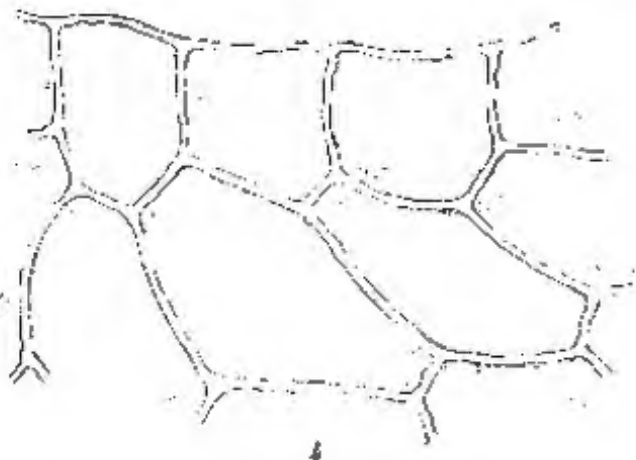


PLATE 19.



PLATE 11.